

BRONZE AGE MILITARY EQUIPMENT



DAN HOWARD

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MILITARY

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Introduction

The Bronze Age is a term that is used to describe a period of time in a society's history when the most advanced type of metalworking utilized bronze; i.e. various alloys of copper and tin. This book will concentrate on the Bronze Age of the Aegean and Near East. Using the most commonly accepted chronology, this dates from 3000 BC to 1200 BC. This is further broken up into Early (3000 BC-2000 BC), Middle (2000 BC-1550 BC), and Late Bronze Age (1550 BC-1200 BC). This book will adhere to this dating system even though there are some reasons to dispute it. The ongoing chronology debate will be discussed below.

The first chapter outlines the various developments in warfare during the Bronze Age and beyond into the Iron Age. Subsequent chapters will concentrate on Bronze Age military equipment describing methods of construction and how the equipment was used, by exploring the archaeological evidence and studying the function of reconstructions. Finally, there are four appendices: Appendices 1 and 2 look in detail at Homeric shields and armour respectively; Appendix 3 describes in detail the equipment and appearance of a selection of warriors from various Bronze Age cultures and Appendix 4 consists of diagrams explaining Bronze Age sword typology.

As stated above, the most commonly used Bronze Age dating system places it roughly between 3000 BC and 1200 BC. This is followed by a 'Dark Age' between the tenth and twelfth centuries—a period for which very little archaeological evidence has been found. The problem with these 'dark' centuries is that when artefacts dating to the tenth century are found, they are exactly the same as the artefacts that date three centuries earlier. This phenomenon has been observed in the Aegean, the Balkans, Asia Minor, Syria, Mesopotamia, Libya, Spain, Italy, and even Egypt. Artefacts found in apparent tenth or ninth century contexts are given an artificially early date because of their similarity to twelfth or thirteenth century items. Some items are given dates

three or four centuries apart by different experts, because items on both sides of the Dark Ages are indistinguishable from each other. Such problems occur with every part of an ancient culture including pottery, construction methods, metalwork, jewellery, artwork, military equipment, and writing systems. Add to this the fact that many settlements show no evidence of abandonment; objects dating to the tenth century are found directly on top of twelfth century items with no evidence of abandonment in between the layers. Sometimes items dating to both sides of the Dark Ages are found in the same layer but, strangely, there are no items dating to the intervening two or three centuries.

This has led some to question the current chronology. If a couple of centuries were removed from some earlier timelines then the Dark Ages would be considerably smaller, or even disappear altogether. The most comprehensive attempt to address this problem was done by Peter James in collaboration with I.J. Thorpe, Nikos Kokkinos, Robert Morkot, and John Frankish.¹ After thoroughly debunking all of the methods used for determining the current chronology, including an analysis of the deficiencies of carbon dating and dendrochronology, the authors proposed that the above-mentioned chronological inconsistencies can be fixed by shortening the Egyptian timeline by about 250 years. This is accomplished mainly by overlapping the twenty-first Dynasty with the twentieth and twenty-second Dynasties. Using this revised chronology, events that supposedly occurred in 1200 BC are now redated to 950 BC, and any date later than c. 800 BC remains unchanged. This neatly closes the gap between the dates in question and removes the Dark Ages altogether.

Many other scholars today admit that a reduction is needed but few of them suggest cutting more than about a century from the timeline. Much more work is needed in this field of study but every year there are new papers supporting a dramatic timeline reduction in line with the proposal of James and his collaborators. One example is a PhD thesis by Pierce Furlong (Melbourne University, 2007) that examined the Near Eastern Chronology. He concluded that the 'conventional chronology is fundamentally wrong, and that Egyptian New Kingdom (Memphite) dates should be lowered by 200 years to match historical actuality'.² His solution involves removing 85 years from the Assyrian chronology between the reigns of Shalmaneser II and Ashur-dan II, and

revising the Egyptian Memphite dates, relative to the Assyrian chronology, down by a further 115 years.

It is unlikely that the problem will be addressed satisfactorily until many of the artefacts in question are reanalysed using more modern carbon dating technologies with a calibration method that is not linked to the old chronology.

Chapter 1

Bronze Age Warfare

‘When did warfare begin?’ This question cannot truly be answered. There are too many assumptions that must be made, including a subjective definition of the term ‘warfare’ and a presupposition that there was a time in mankind’s history when warfare did not exist. Most of the arguments for early warfare are anthropological in nature with scholars making the assumption that human societies went through an ‘evolutionary progression’ from bands of hunter gatherers to either nomadic pastoralists or fixed settlements of farmers, which developed into a city-state that exerts control over the local area. Warfare spread as the wealth and size of permanent settlements increased. Humans began to specialize in certain occupations, such as the ‘warrior’, who formed part of an elite warband that served as the core for raiding parties or homeland defence. Warfare occurred between settlements, but more commonly between a settlement and nomadic pastoralists. It is said that nomads viewed farmers with contempt as ‘plant-eating slaves to their fields’; they were just another resource to be exploited. This methodology works in a general context but is too rigid to be of much practical use, since it is clear from primitive societies in recent times that some tribes resolve disputes through discussion and mediation, some make use of ritualistic contests with little actual bloodshed, while only some resort to violence.

This work avoids the philosophical aspects of the subject and instead uses the general phrase ‘organized violence’ to define warfare. It begins at the period when the weapons found at various Neolithic sites seem to have begun to be modified specifically for use against fellow humans and explores the time period in which organized violence becomes more widespread. This evidence must be examined carefully, though. A single skeleton with weapon trauma may have been executed or murdered, while simultaneous burials

of multiple skeletons with weapons damage are more likely to be evidence of warfare. Bows, slings, and spears are equally suited for hunting as for combat so cannot be used on their own to determine whether warfare was practiced. The mace seems an exception that will be discussed in a later chapter (see 'Weapons', pp. 23–25). Circumvallation is another good indicator of endemic warfare and will be discussed below (see p. 5).

Edged weapons in the Neolithic period (8500–4500BC) consist of axes, spearheads and arrowheads made of stone such as flint, chert, or obsidian. They were probably used for both hunting and warfare, though the latter is unlikely to have been endemic at this time. The late Neolithic is characterized by self-sufficient, fairly isolated settlements. Warfare was probably limited to raiding parties and minor skirmishes.

Violence seems to have accelerated at the end of the fifth millennium. This is called the Ubaid period (5000–4000 BC) after a shared style of material culture that spread throughout the Middle East. This growing similarity between the material cultures of different regions suggests ongoing social and economic contact. Agriculture spread out to cover more and more of the land and for those who could not retreat; the only alternatives were submission or counter-aggression. There is also evidence of periodic droughts in the region and these may have contributed to social upheaval and increased violence.

Safety in numbers encouraged people to consolidate into larger and larger settlements. Religion thrived and huge temples and monuments were constructed. The end of the Ubaid period sees the transition into the Chalcolithic period where items start to be made from copper and its naturally-occurring alloys (such as arsenic-copper). Societies developed until hundreds of thousands were controlled by a warrior elite ruled by a king. This process first seems to have occurred in ancient Sumer, a group of city-states between the Tigris and Euphrates Rivers in what is now Iraq. The Greeks called it Mesopotamia ('the land between the rivers'). It is in Sumer that the earliest known copper-alloy spearhead was found (dating to c. 4000 BC).

It isn't until the second half of the fourth millennium, known as Late Uruk period (3500–2900 BC) that large-scale warfare is evident. The development of complex

administrative systems helped to manage a city-state, raise and provision standing armies, and keep them in the field for extended campaigns. Surviving iconographical evidence suggests that a similar type of warfare was practiced from Sumeria along the Euphrates and into Syria.¹

The end of the Uruk period introduces the Early Dynastic period (2900–2650BC) which sees Sumeria divided into independent feuding city-states. Violence was used as a tool to maintain the balance of power. Military objectives were limited and campaigns short. William J. Hamblin writes that the scope of fighting was limited to an area of about 300 miles.² The best recorded feud during this time was between the cities of Umma and Lagash, which were only about 25 miles apart. Hamblin notes that the greatest distance of any campaign was between Kish and Elam, no more than 160 miles. Each city fought to give its ruler the title Lugal Kish ('Headman of Kish'). He was the first among his peers rather than being an absolute ruler. The title carried religious as well as military significance.

The Sumerian tablets of Shuruppak (2600 BC) indicate that during this time the city-states provided for the maintenance of 600–700 full time soldiers. A century later the Stele of Vultures was carved to celebrate the victory of King Eannatum of Lagash over Enakalle of Umma. It portrays the King of Lagash leading a massed formation of helmeted infantry, armed with spears and shields. The king, with a piercing axe, rides a chariot drawn by four onagers (wild asses). Here we see the beginnings of the phalanx that was to dominate the battlefield many centuries later. The phalanx, or shield-wall, was a primitive formation that minimized the limitations of poorly trained conscripts while offering good protection so long as they maintained tight ranks. Battle was over quickly and casualties could be high for the loser. The Stele of Vultures records over 3,000 Ummaite casualties for that particular engagement.

Eventually a military campaign by Sargon the Great (c. 2300 BC) united all of Mesopotamia and provided the world with its first military dictatorship. One account records that his core military force numbered 5,400 men. Sumer became one of the more advanced of the early Bronze Age civilisations, both culturally and militarily. Defences consisted mainly of copper-alloy helmets and large shields. Some argue that metallic helmets proved so effective that

they drove the mace from the Bronze Age battlefield.³ The most common weapon was the spear, but some troops would have carried axes or daggers. Vehicles of the time were slow and awkward, being pulled by animals such as onagers rather than horses. It is more likely that they were used for transportation rather than being deployed tactically on the battlefield.

Copper and Bronze

Like gold and silver, copper metal can be found in its natural state and is easy to work. The earliest worked copper objects were polished malachite beads found at Çayönü in Anatolia and dating to the ninth millennium BC. The fashioning of soft metals into small objects like beads and pins is known as 'trinket metallurgy' and this is the only kind of metalwork evident until the end of the seventh millennium. The earliest copper weapon ever to have been discovered is a mace head found at the city of Can Hasan in southern Anatolia, and dating to the sixth millennium (see 'Weapons', pp. 24-25).

Copper became more plentiful when it was discovered how to smelt it from ores, and easier to work when casting was developed. The earliest evidence for smelting in the Middle East is in Çatal Höyük in Anatolia, dating to the early sixth millennium, but smelting is evident in the Americas and in the Balkans, so it is likely that the technology was developed independently by different peoples. By the end of the fifth millennium in the Middle East, casting and smelting was widespread in Anatolia, Canaan, Iran, Mesopotamia, and Syria. Copper was the most plentiful in Anatolia, Iran and the Levant. Avilova writes that these regions 'have cupriferous areas rich in native copper and copper ore deposits, both oxidic and sulphide. This contributed substantially to local population's acquaintance first with native copper and then melting copper of ores. With this development the use of copper expanded dramatically and the earliest independent centres of production and use of metal emerged.'⁴

While copper was plentiful in the above regions it was scarce in Egypt and Mesopotamia. Roaf argues that the need for access to copper mines or copper markets was one of the driving factors behind early imperialism.⁵ If copper couldn't be peacefully traded then military force was used to secure access. It became a cycle; greater need for metal led to

larger armies which, in turn, required more metal to equip.

Copper is a soft metal and doesn't hold an edge well. Sometimes it is found naturally alloyed with metals such as arsenic, which produce a harder metal, but it was rare to find a naturally-occurring alloy with just the right combination of elements to make a good weapon. The first man-made copper alloy was bronze, a combination of copper and tin. Bronze working seems to have begun at the end of the fourth millennium; the earliest bronze objects were found in Syria dating to this time period. It is the commonly accepted date for the beginning of the Bronze Age, though copper items continued to be widely used.

Avilova studied 658 copper-based objects found in Anatolia.⁶ Forty-two of them were dated to the Chalcolithic period; of these, twenty-six were pure copper, thirteen were copper-arsenic alloy, and one was copper-tin (bronze). Of the above 658 objects, 127 date to the Early Bronze Age. Of these, nineteen were pure copper, ninety-five were copper-arsenic, and ten were copper-tin. The majority of the above 658 items dated to the Middle Bronze Age. There was a total of 498 items, of which sixty-three were pure copper, 250 were copper-arsenic, and 155 were copper-tin. It is apparent how the use of tin as an alloying element increases in frequency as the Bronze Age progresses, but copper and arsenic-copper alloys were still being used.

While both copper and tin can both be found naturally in their metallic form, bronze cannot. It requires a mastery of the skills of melting and alloying of metals. It is unclear how it was first discovered that adding tin to copper produced a superior metal. Van der Heide believes that it might have been the serendipitous result of using tin-laden stones, such as cassiterite or stannite, to line a copper smelting furnace.⁷ The main source for tin during the Bronze Age was Afghanistan; the Sumerians knew the region as Aratta or Tukrish. Hamblin uses as an example the Middle Bronze Age settlement of Kanesh (Nesha) in Anatolia where surviving records describe shipments of a total of 80 tons of tin to Anatolia over a fifty-year period from Afghanistan through Assyria to Kanesh with a markup of at least 100 percent along the way.⁸ In the 1980s there was a tin mine located in Anatolia in the central Taurus Mountains; the mine was at Kestel and an associated smelter was nearby at Goltepe,⁹ but it would not have supplied enough tin to meet local demand.

Even though copper alloys had been in use before the Bronze Age, Hamblin makes sense when he argues that true Bronze Age warfare begins when bronze is widely distributed to the troops.¹⁰ This doesn't occur until large supplies of tin are secured in the Middle Bronze Age (2000–1550 BC). Before this period, weapons of stone and natural copper alloys were used alongside bronze ones. During the Middle Bronze Age armies start to be equipped with bronze weapons. Arrowheads seem to have been the last to be made of bronze, and this is likely to have been because of the nature of the weapon. Bronze might have been more widely available during this time, but it was still not cheap enough to put on disposable arrows. At the end of this period even body armour starts to be made of bronze, but it is only available to the elite (see the chapter on 'Armour', p. 65).

Circumvallation

Circumvallation is probably the best way to determine when warfare came to a region since it is difficult to imagine a reason why a settlement would construct fortifications if they didn't feel threatened by violence of some sort. The ancient city of Jericho is the oldest known example of a fortified town with its wall and tower dated to the early seventh millennium. Yigael Yadin records its circular tower as 10m high, 13m in diameter at its base, and 10m in diameter at the top.¹¹ The rock wall was calculated to have been 3m wide and 4m high. But it stands alone as an example of a walled settlement in the region (other settlements of the time were unfortified) and so cannot be used as early evidence for widespread warfare during that period.

It is in Anatolia that we find a group of fortified settlements dating to the fifth-sixth millennium. They include Aşıklı Höyük, Çatal Höyük, Hacilar, and Kuruçay Höyük. Aşıklı Höyük consisted of a mud brick wall surrounding a settlement of mud-brick houses grouped together in clusters. Like Çatal Höyük, there were no doors in the exterior walls of the buildings, so they must have been accessed by means of ladders, probably through holes in the roof. Çatal Höyük doesn't have a perimeter wall at all. The houses are all joined together, sharing common walls, with no doors between them. The outer walls of the outermost houses form a continuous defensive barrier. Access is gained via ladders to

holes in the roof. A single fortified gate allows entry to the complex from outside.

The original settlement of Hacilar was not protected by a wall at all and was razed around 5500 BC. It was rebuilt with a stone wall between 1.5m and 3m thick. It was razed again in c. 5250 BC and rebuilt with a stronger fortification, and razed a final time in c. 4800 BC, when it was abandoned. Kuruçay Höyük was settled for a period of about five thousand years between the Neolithic and the Early Bronze Age with thirteen layers of habitation during that time. Its defences were constructed around the same time as the other settlements and consisted of a stone wall with semi-circular towers.

Expansion and Conflict

Near the end of the nineteenth century, the city of Assur began to expand its influence under the reign of Shamshi-Adad (reigned 1813–1780BC). He succeeded in extending Assyrian territory from the Zagros Mountains to the Mediterranean Sea. However, the empire did not survive being passed to his son, Ishem-Dagan, who was defeated in 1760 BC by the Babylonian king, Hammurabi, who annexed most of the Assyrian territory. The Babylonian Empire did not survive long either. The Kassites invaded the southern parts of the empire in the sixteenth century and overthrew the ruling elite. In the north, the Hurrians invaded and their influence reached as far west as Palestine. The Hurrians were, in turn, supplanted by another, unnamed people of Indo-European origin.

During this time the Egyptians were also having problems. The second intermediate period (18th century) marks the time when the Hyksos invaded and overthrew the Pharaoh. According to the *Aegyptiaca* of Manetho, the ruler of the Hyksos, Salitis, founded the Fifteenth Dynasty in Egypt, and ruled in the eastern Nile Delta region. It is uncertain, however, whether the upheaval was caused by military invasion or civilian migration.¹² However, Hyksos domination was never strong in southern Egypt, which remained under the control of the rulers of Thebes—who nevertheless paid tribute to their Hyksos overlords. Eventually Thebes declared itself independent and established the Seventeenth Dynasty, ultimately driving the Hyksos out of Egypt. By the end of this

Dynasty, they had control over all of Egypt and had resumed control over the territories of Nubia and Canaan.

In the fifteenth century, the Mitannians controlled all of the territory in northern Mesopotamia. These people were, in turn, conquered by the Hittites. During this time, Hittite influence spread south and Egyptian influence spread north until they came in conflict in the Levant. This culminated in the Battle of Kadesh in 1274 BC.

Further west was another great civilisation, the Mycenaeans. This military culture invaded Greece in the 20th century or a little earlier and mixed with the natives of the region to create the Greek language, which eventually extended to the rest of the mainland with the possible exception of Macedonia.¹³ This period of expansion is known as the Middle Helladic Period. The people are named after their largest city, Mycenae, which is located in the hills between two of the higher peaks of the Arachneion range of north-east Peloponnese. The citadel lay on the divide between pastoral and agricultural land. It had a commanding view of the south-west plain towards Argos and had good lines of communication throughout the region. The Mycenaeans initially traded with the Minoans on the island of Crete, but by 1400 BC they dominated the island. It is during this time that the Linear B script of the Mycenaeans supplants the Linear A of the Minoans. The Mycenaeans seem to adopt many aspects of Minoan society.

A Mycenaean army during this time seems to have been no different from any other army during the same time period. Initially, it centred around heavy infantry with spears, large shields, and little in the way of armour. The earliest illustration (c. 1600 BC) was found on Thera (Akrotiri fresco) and shows men bearing long spears and long rectangular shields apparently faced in animal hide. They have no armour except for a boars-tusk helmet (see 'Aegean Helmets', pp. 82-83) and are barefoot. A century later on the mainland, Mycenaeans are depicted with long 'figure-8' and 'tower' shields with a curved upper edge, which still seem to be faced with hide. These spearmen are accompanied by archers. Still, none of the men is armoured in anything other than a boars-tusk helmet. It is likely that warfare during this time involved infantry shield walls and exchanges of arrows, similar to how warfare was conducted further east.

Archery

During the later part of the Bronze Age, archery seems to have been an important element in all conflicts, both on foot and in chariots. It will be demonstrated that the preferred method of using the chariot in Bronze Age warfare was as an archery platform—even in Greece (see the chapter on ‘Chariots’, p. 52). However, this is only one part of an army. The use of bows by infantry troops must also be examined. Egyptian correspondence suggests that archers were in high demand. In the 14th century during the reign of Akhenaten, various petty kings sent requests to the Pharaoh for military aid.¹⁴ Foremost is the desire for archers:

Send me 50 pairs of horses and 200 infantry that I may resist him in [the city] Sigata until the coming forth of the archers.’ (EA #71)

Send a large force of archers that it may drive out the king’s enemies and all lands be joined to the king.’ (EA #76)

If within two months archers do not come out, then ‘Abdi-Ashirta will certainly come up and take the two towns.’ (EA #81)

What are the sons of ‘Abdi-Ashirta that they have taken the land of the king for themselves? May the king send archers to take them.’ (EA #123)

The above passages are clearly referring to infantry archers since chariot units are always referred to as either ‘horses’ (EA #71, #85, #106) or ‘chariots’ (EA #87, #243). During the battle between Merneptah and Meryre near the end of the 13th century, the Egyptian record states, ‘The wretched, fallen chief of Libya, Meryre, son of Ded, has fallen upon the country of Tehenu with his bowmen’.¹⁵ It is unlikely that the Libyan army consisted entirely of bowmen, so one could infer that the Egyptians placed little importance on any troops

other than archers. It seems evident that the archer dominated the battlefield during the Middle Bronze Age, whether mounted in a chariot or on foot. Robert Drews supports this, concluding that it was difficult to see how a mass formation of infantry could have contributed to chariot-dominated battles.¹⁶

There is evidence of widespread archery in the *Iliad*. Paris was an archer; so were Odysseus, Teukros, Pandaros, and Helenos. It is also likely that many low ranking infantry troops used bows (15.313-4, 15.709). The Lokrian contingent is described as consisting entirely of archers and slingers (13.712-8), and Akamas refers to the Argives as 'arrow fighters' (14.479). Homer describes how 'many sharp spears were driven home about Kebriones and many feathered arrows sprung from bowstrings' (16.772-773). He also refers to a 'swarm of missiles' (13.555). Many of the main characters were injured by arrows: Menelaos (4.127-147), Diomedes (11.375-8), Agamemnon (16.26), and Eurypylos (11.582). Achilles was eventually killed by an arrow. Homer's depiction of the Trojan War gives the impression that both bows and javelins were used extensively, but that javelins were becoming more prevalent than they were during earlier times.

Extant bows discovered in Egypt suggests that they occasionally used composite bows made of horn, wood and sinew, but self bows (made entirely of wood) were more common. It is likely that the composite bow was reserved for the elite since it took considerable time to manufacture and would have been more expensive. The earliest example of a composite bow was found in the tomb of the Egyptian warrior, Ahmose Penhat, who served during the reign of Thutmose (early 16th century).¹⁷ (For more on bows, see 'Weapons', pp. 27-30.)

Chariot Archery

Chariot warfare underwent some changes during the Bronze Age. Initially animal-drawn vehicles were heavy, ponderous 'war wagons' that didn't seem to have much influence on the outcome of a battle. During this early period, as noted above, the battlefield was dominated by massed infantry armed with either spears and large shields or bows.

Later, during the 'Golden Age' of the great civilizations of the Egyptians, Hittites, Assyrians, Hurrians, Aryans, Chinese, Mycenaeans, and so on, the chariot evolved into a light, fast platform. It will be shown later that all of the military powers during this time used the chariot as an archery platform (see 'Chariot Warfare', see pp. 54-57) and not, for example, as a 'shock' vehicle for charging the enemy with a long thrusting spear. This mobile archery platform seems to have been the preferred military use for chariots from around the 17th century through to the 'Transitional Period' outlined below (see p. 10). In general terms, chariots at this time were just a means of improving the versatility of the archers mentioned above. Other weapons were carried on board but they were only back-up weapons. The bow was the primary means of attack.

Some of the Amarna letters also suggest that chariots were used, not only in open battle, but during sieges also.

He has stationed the Apiru and chariots there, and they have not moved from the entrance of the gate of Gubla. Look, urged the king, my lord, with loud cries! Let an elite force, [together with] chariots, advance with you that I may ... [... the Apir]u from it [the gate].' (EA #87)

I have obeyed the orders of the king, my lord and my Sun, and I am indeed guarding Magidda, the city of the king, my lord, day and night. By day I guard [it] from the fields with chariots, and by night on the walls of the king, my lord.' (EA #243)

To defend during a siege the chariots probably sallied forth to take the enemy by surprise. They would also have been useful to control various approaches to the city and to patrol the perimeter, either to give early alert of aggressors or to prevent the besieged from being relieved by an ally.

Infantry

Robert Drews argues that the vast majority of Bronze Age infantry was poorly trained and not disciplined enough for offensive manoeuvres. Its primary task seems to have been to simply hold formation and provide a line behind which the chariots could regroup. During the Battle of Kadesh, for example, Drews wrote that the infantry, 'seem to have provided a cordon or a resort to which an individual chariot could retire if one of the crewmen were killed or wounded, or to which the entire chariot host could flee in the event of a rout.'¹⁸

Both the Hittites and the Egyptians used their infantry in the same way.¹⁹ In open battle, they took little or no direct role in the fighting, which was dominated by the chariots. Other uses of infantry would be to hold ground, to besiege or assault a fortified settlement, and to engage the enemy on terrain unsuitable for chariots. A small corps of well-trained infantry called 'chariot runners' operated in support of the charioteers,²⁰ and archers in the infantry cordon would have shot at any enemy troops in range. The Assyrians used this tactic to great effect: the basic unit in the Assyrian army involved an 'archer pair', which consisted of an archer protected by a spearman wielding a large shield.²¹ Homer describes a similar tactic when Aias uses his shield to protect Teukros while he shoots arrows (*Iliad* 8.266–72). The Persians later modified this tactic by increasing the number of archers per shield bearer.²²

Egyptian lists of booty provide strong evidence in support of the lack of infantry involvement. At Megiddo, Thutmosis' army took away 2,041 horses and 924 chariots, but only killed 83 men.²³ If there had been some sort of an infantry clash then one should assume that there would have been many more casualties. The equipment of the infantry supports this. Infantrymen seem to have been poorly armoured and to have carried nothing but a full-length shield and a spear (and sometimes a helmet). This shield is large enough to protect both the bearer and perhaps a companion archer from enemy arrows, but is likely to have been a hindrance when engaged in a *mêlée*. Their two-handed spears may have been intended to fend off chariots, not to engage enemy infantry. The goal of each chariot charge appears to have been to disable as many of the opposing chariots as possible by killing the horses.²⁴ Homer mentions

taking out one of the chariot's horses to pin the vehicle in place so as to keep it as spoils if the crew abandons the vehicle or gets killed. Paris targets the horses of Nestor's chariot in such a way.

The majority of the action in the *Iliad* involves a series of skirmishes between small groups of aristocratic chariotry supported by a limited number of followers, and the masses seem to have little role in the battle. However, the fact that Homer's charioteers are primarily not archers (with a few exceptions) suggests that Homer had little idea of how to depict Mycenaean combat, thus supporting Drews' and Finley's conclusion. Finley wrote that Homer had heard of chariots, 'but he did not really visualize what one did with chariots in a war.'²⁵ This conclusion, though, can only be reached if one assumes that warfare remained unchanged right through to the end of the Bronze Age. It will be shown that this is untrue. There must have been a period of transition between the time when the chariot archer dominated the battlefield and the classical period when hoplite infantry was supreme. It will be demonstrated that the Trojan War falls within this transitional period and that Homer's depiction of warfare is not too far removed from what may have occurred on the battlefield during this time.

The Transitional Period

The chariot archer seems to have lost his pre-eminence by the end of the Bronze Age. During this time infantry once again dominated the battlefield with the chariot playing a supporting role. Archery also seems to have diminished, especially in the Aegean, in favour of thrown javelins. It is these new infantry tactics supposedly introduced by 'barbarians' that Robert Drews concludes was the reason for the collapse of the great civilisations. In Greece, this was a transitional period between the earlier era that was dominated by chariot archers and the classical period that was dominated by the hoplite phalanx.

While it is demonstrable that infantry were using new tactics at the end of the Bronze Age, it is not reasonable to conclude that the introduction of these tactics by invaders caused the downfall of the chariot powers, since it is likely that these empires had adopted the same tactics around the same time. One could reasonably expect this transitional

period to retain remnants of earlier warfare, but incorporate early developmental stages of hoplite tactics as infantry troops become more dominant on the battlefield. Van Wees argues that, in the *Iliad*, the masses did, indeed, take part in the fighting, and that Homer simply chose to focus on the deeds of his heroes.²⁶ Van Wees' infantry represents a transitional time for these troops. They were no longer bystanders, but they had not yet become the disciplined hoplite phalanx of classical times. The *Iliad* reveals hints of a rudimentary phalanx formation (13.130-4, 17.364-5) and demonstrates the additional protection afforded to infantry if they maintain tight ranks, protecting each other. Homer wrote, 'but far fewer of them (the Danaans) went down, since they remembered always to stand massed and beat sudden death from each other' (17.364-5). On another occasion, Aias was hard pressed to hold his place in the line after suffering a barrage of missiles (16.105-108), implying that javelins and arrows were used to break up these formations.

The proposed transitional period seems to have occurred during the same time further east, when the archer was gradually replaced by javelin throwers.²⁷ The chariot of Rameses II (1279-1213 BC) is one of the earliest to be depicted with a javelin case and it is reasonable to use his reign as the approximate beginning of the transitional period. This is the period in which the infantry began to play a more dominant role. During the battle between Merneptah and Meryre in 1208 BC, the Egyptian record notes that 6,359 Libyans and 2,370 non-Libyans were killed.²⁸ In 1182 BC, Rameses III claims to have killed 12,535 enemy soldiers during another Libyan invasion.²⁹ These casualties clearly demonstrate that there was a pitched infantry battle, and stand in stark contrast to the light casualties of earlier battles where the infantry took little part. Not only did the lower ranks participate in pitched battles, but the elite seem to have begun to abandon the chariot also. Rameses III is the first Pharaoh not to be depicted fighting from a chariot—he is afoot swinging his sword at the enemy (Breasted, IV.106). There is little reason not to assume that the masses of infantry in the *Iliad* were just as involved, supporting van Wees' analysis. Homer certainly mentions on multiple occasions the masses of dead scattered on the battlefield.

One possible explanation for the transition from archers to javelineers is the increased use of heavy body armour by

infantry. In the *Iliad* there are occasions when bronze cuirasses prevent arrow injuries (13.586-7), but there is not one example of this armour being proof against a javelin. Always, javelins seem to inflict serious injury or death (3.358, 5.19, 5.305-8, 5.611-7, 11.436, 13.186, 13.370-3, 13.398, 16.312, 16.400). By the time of the Greek phalanx, the front ranks were encased in bronze and the effectiveness of arrows was greatly reduced, so the javelin became the weapon of choice. Whenever the Greeks needed archers they recruited foreign auxiliaries such as Scythians and Cretans. A comparison to this can be found in the *Iliad* with the Lokrians providing this capacity (13.712-9).

The Decline of the Chariot Archer

Drews writes that the chariot archer declined because he was susceptible to lightly armoured javelin-wielding infantry, which began to dominate the battlefield during the 12th century.³⁰ This does not seem logical, though. The chariot archer had many advantages over the javelineer: longer range, greater speed, and a capacity to shoot more volleys. These javelin-skirmishers did without larger shields and heavy body armour in exchange for increased mobility. This lack of protection would have left them even more vulnerable to arrows. There is no reason to conclude that chariot archers were more vulnerable to javelineers than to archers, and there is no evidence outside of Greece that numbers of chariots declined sharply during this time. Solomon, who ruled during the proposed transitional period, is reputed to have kept a force of 1,400 chariots (*1 Kings* 10:26). The Assyrians also had extensive numbers of chariots, and it is possible that Assyrian chariotry was actually expanded during this period. If the javelineer was not employed to counter chariot archers then there must have been another reason.

As suggested above, one likely reason was the increased use of body armour by infantry. Drews notes that, in the Bronze Age, 'there is no documentary or pictorial evidence at all for heavily armoured infantrymen.'³¹ Bows would have been very effective against these sorts of troops, having to penetrate nothing more substantial than cloth and flesh. Against armour, however, arrows are less effective (see 'Defensive Capability of Bronze Age Armour', p. 84). During

the proposed transitional period, increasing numbers of infantry began wearing armour. The Medinet Habu relief of the Egyptian battle in 1179 BC depicts infantry on both sides wearing waist-length corselets and it is possible that their skirts were also armoured. The Assyrians began to protect their infantry—even their archers—with coats of scale and conical helmets, especially after the reign of Ashurnasir-pal.³² In Greece, the emergence of the bronze-armoured hoplite relegated the archer to auxiliary status and the javelin-wielding peltast emerged as the preferred skirmisher.³³ It seems evident that the javelin was employed in order to more effectively counter armoured infantry.

As the bow became decreasingly effective, the archer became less useful, and the chariot in which he used to fight evolved from a mobile archery platform to a vehicle for javelineers and heavy infantry. A stone seal recovered from Vaphio depicts a charioteer about to throw a javelin.³⁴ A pottery fragment from Tiryns dating to this period shows armoured warriors carrying a round shield and two javelins.³⁵ Warriors could either throw their javelins whilst in the chariot or, as often described by Homer, they could dismount and fight on foot. The driver would keep the chariot nearby for a quick retreat (*Iliad* 5.321–2, 13.535–9, 14.430–2, 16.657). In these battles, infantry, rather than chariots, decided the outcome.

As previously mentioned, the reign of Rameses III in the 13th century marked the approximate beginning of the transitional period from chariot-dominated battles to infantry-dominated ones. The battle between Merneptah and Meryre at the end of the century is the first conflict in which it can be demonstrated that there was a pitched infantry battle.³⁶ Before this time, casualties were extremely light and it is likely that there were few infantry clashes. After Merneptah's victory it is evident that the infantry played a more important role. Merneptah praised the valour of a group of warriors called *mnfyt*. The Egyptologist James Henry Breasted translated this word as 'militia' (III.578). These men are not chariot runners (who were called *phrr*) so they are probably part of the massed infantry. A more accurate translation for *mnfyt* would be 'veterans'. These men are distinguished from another section of the infantry called *nfru* which means 'recruits'. A term for the infantry as a whole might be *nakhtu-aa* or 'strong arm boys,' implying

mêlée troops.

As previously mentioned, during the battles of Rameses III in the 12th century, the Pharaoh is depicted for the first time fighting on foot (Breasted, IV. 106). This strongly suggests that chariot archery was becoming less important, even amongst the nobility, and contradicts Drews' implication that these new infantry tactics were only adopted by the invaders. Rameses claims to have won three significant victories, in two of which Libyan casualties are recorded. In one battle there were 12,535 Libyan casualties and in another 2,175 (Breasted, III.588). In China during the 'Warring States' period, there was also a transition from a chariot-dominated army to one dominated by infantry. Sawyer writes that there was 'a shift from reliance on the personally loyal chariot elite, to a new and difficultly achieved reliance on the rural masses.'³⁷ He further notes:³⁸

By the 4th century Chinese armies consisted of infantry companies of 70 men headed by one command chariot. Cavalry had been introduced from the steppes and the sword had replaced the bow as the primary weapon. Chariotry and archery were relegated to supporting roles.

From Greece to China, infantry troops were becoming more directly involved in the fighting. However, the chariot had not disappeared from the battlefield. It was no longer used as an archery platform, but it still had other uses.

Shock Tactics

While not immediately relevant to the Bronze Age, it is important to note the later evolution of chariot tactics to understand why the vehicle gradually disappeared from the battlefield. In Greece, the chariot first evolved from a light archery platform to the javelin platform and 'battle taxi' described by Homer.³⁹ Then it was phased out of Greek warfare completely. Further east, the chariot evolved from a light archery platform to a heavier vehicle used for shock tactics. According to Gabriel and Metz,⁴⁰ the Assyrians were

the first to do this:

The Assyrian chariot's tactical role ... maximized the role of shock. The idea was to attack enemy infantry formations from as many directions as possible to deliver maximum shock. Once engaged, the crews dismounted and fought as infantry.

According to Xenophon, however, Cyrus was the first to introduce the heavy chariot:

The method of managing a chariot employed of old at Troy and that in vogue among the Cyrenaeans even unto this day he [Cyrus] abolished; for in previous times people in Media and in Syria and in Arabia, and all the people in Asia used the chariot just as the Cyrenaeans now do. But it seemed to him that inasmuch as the best men were mounted on the chariots, that part which might have been the chief strength of the army acted only the part of skirmishers and did not contribute anything of importance to the victory.... So he abolished this method of handling chariots, and in place of it he had chariots of war constructed with strong wheels, so that they might not easily be broken, and with long axles; for anything broad is less likely to be overturned. The box for the driver he constructed out of strong timbers in the form of a turret; and this rose in height to the drivers' elbows, so that they could manage the horses by reaching over the top of the box; and, besides, he covered the drivers with armour, all except their eyes. On both sides of the wheels, moreover, he attached to the axles steel

scythes about two cubits long and beneath the axles other scythes pointing down toward the ground; this was so arranged with the intention of hurling the chariots into the midst of the enemy. And as Cyrus constructed them at that time, such even to this day are the chariots in use in the king's dominions. (*Cyropaedia* 6.1.27-30)

From the above passage it seems that, before Cyrus' innovations, chariots were used at Troy and elsewhere by skirmishers who contributed little to the outcome of a battle. This directly contradicts the argument that Homer's chariots were used by shock troops carrying long spears. Cyrus' chariot was the first to be used as a 'shock' weapon, charging into a formation and hoping to frighten the troops into routing, when its scythed wheels could cut men down as they fled. As noted previously, though, many horses are unwilling to charge into an unbroken line of spearmen. Missiles are needed to break up the formation first, or the simple spectacle of these fearsome vehicles bearing down might be enough to cause some troops to flee without engaging. Xenophon describes how these chariots functioned.

In front ... were the so-called scythe-bearing chariots, at some distance from one another; and the scythes they carried reached out sideways from the axles and were also set under the chariot bodies, pointing towards the ground, so as to cut to pieces whatever they met; the intention, then, was that they should drive into the ranks of the Greeks and cut the troops to pieces. (*Anabasis* 1.8.10)

At the Battle of Cunaxa in 401 BC, Plutarch writes that the Greek hoplites used a river to secure their right wing and refused to leave its protection for fear of being outflanked by the scythed chariots.⁴¹ He also writes that Artaxerxes specifically chose his best chariotry to confront the Greek

phalanx.⁴² Contrary to many historians who dismiss the scythed chariot as 'useless', contemporary commanders apparently believed that it was effective against close formations of infantry. At Cunaxa the chariots' very presence prevented the Greek hoplites from moving away from the security of the river, thus severely limiting the phalanx's effectiveness in the battle.

Xenophon believed that the hoplites were able to defeat the Persian chariots by simply opening their ranks and allowing the vehicles to pass harmlessly through (*Anabasis* 1.8.20). This is difficult to imagine with a dense formation of heavily armoured hoplites, regardless of how disciplined they were—especially a formation that was hampered by a river on one flank. It is more likely that the lightly armed, javelin-wielding peltasts were responsible for this tactic, and it is reasonable to conclude that the peltasts were responsible for neutralising Artaxerxes' chariots. Xenophon notes that the peltasts formed up beside the hoplites on the right wing (*Anabasis* 1.8.5). These extremely mobile skirmishers would have been quite capable of moving to intercept the chariots before they reached the phalanx. Many of the chariots that reached the phalanx were empty (*Anabasis* 1.8.20), suggesting that their passengers had been dispatched by missile weapons. Xenophon implies that the peltasts were well practised in this manoeuvre when, after the death of Cyrus, he describes how they defeated a charge of Tissaphernes' cavalry.

Tissaphernes had not taken to flight in the first encounter, but had charged along the river through the Greek peltasts; he did not kill anyone in his passage, but the Greeks, after opening a gap for his men, proceeded to deal blows and throw javelins upon them as they went through. (*Anabasis* 1.10.7)

The same tactic was used by Alexander at Gaugamela in 331 BC. If a highly trained phalanx was capable of opening and allowing chariots to pass through, then Alexander would have had no need to counter the Persian chariot charge with a screen of light infantry. Bosworth writes that the

'Agrianians and javelin-men showed terrifying skill and agility in shooting down the horses and diverting the chariots.'⁴³ Caesar's experiences in Britain support the argument that heavy infantry was ineffective against chariots.

It was seen that our troops were too heavily weighted in armour to deal with such an enemy: they could not pursue them when they retreated and dared not get separated from their standards. The cavalry, too, found it very dangerous work fighting the charioteers; for the Britons would generally give ground on purpose and after drawing them some distance from the legions would jump down and fight on foot, with the odds in their favour. (*BGall.* 5.16)

Several observations can be made from this passage. Firstly, that chariots could keep out of reach of the infantry. Secondly, the slow moving, relatively close formation of the Roman cohort was not effective against the extremely mobile, open formation of chariots. Thirdly, the British charioteers considered themselves at a disadvantage when facing cavalry, and so dismounted to fight on foot. It would seem from this that chariots were vulnerable to cavalry, which would have been faster and more manoeuvrable. Caesar confirms this when he describes a cavalry charge the following day, which was successful because it prevented the charioteers from rallying or jumping from their chariots (*BGall.* 5.17).

Although heavy infantry seems to have been vulnerable to the scythed chariot, both Cunaxa and Gaugamela demonstrate that this chariot was vulnerable to infantry armed with javelins. Caesar implies that javelins alone are not enough to counter chariots. The Romans had the *pilum*, a heavy javelin designed to break up an enemy formation and disable shields before the Romans engaged in hand-to-hand combat, but it did little damage to the British chariots. It is likely that the key was the manoeuvrability of the troops. Xenophon's peltasts and Alexander's javelineers were lightly armoured and operated in a more open formation than the

Romans.

Although effective against heavy chariots, javelin skirmishers would have been largely useless against the light chariot of the Bronze Age. As mentioned above, the chariot allowed bowmen to attack infantry in complete safety because they were fast enough to stay out of reach. The chariot archer was the ideal unit to counter these light javelineers, having both greater speed and a longer range of fire. The lack of armour and the small shields carried by skirmishers would have left them vulnerable to arrows, unlike the better-protected heavy infantry. From this viewpoint, the assumption that the chariot archer was no longer an effective unit is not reasonable. So why did it disappear? It will be shown that the chariot archer did not depart the battlefield at all. He simply moved from chariot to horseback.

The Rise of Cavalry

Ninth century Assyrian reliefs depict an apparent transition from chariot archers to cavalry archers. They show warriors operating in paired teams riding two horses. One man controls both animals while the other is shooting his bow.⁴⁴ There are two main advantages of this form of combat over the chariot. Firstly, the expense of the chariot is eliminated.⁴⁵ Secondly, horses no longer encumbered by the chariot can move faster and through a wider range of terrain types. A passage from Arrian after the defeat of Darius by Alexander demonstrates that horses were better suited to rough terrain:

Keeping to his chariot as long as there was smooth ground to travel on, he [Darius] was forced to abandon it when ravines and other obstructions barred his way; then ... he leapt upon a horse and rode for his life. (Arrian, *Anabasis Alexandri* 2.11.5)

The disadvantage of the above unit was that it still required two horses and two men for it to operate. The development of independent horse-archers redressed this problem. Once the need for a 'driver' disappeared, each horse could have its

own bowman, doubling the firepower previously available.⁴⁶ One disadvantage of this was that a horse-archer's shooting arc covered only 120 to 220 degrees,⁴⁷ whilst the chariot had a full 360 degrees. The other disadvantage was that the stable shooting platform once provided by the chariot was no longer available, and accuracy may have declined as a result.⁴⁸ The advantages far outweigh the disadvantages, however, and once the skills of fighting from horseback had been mastered, there was no longer any need for the chariot archer. Xenophon comments that his troops—including the peltasts—were ineffective against mounted archers:

And the Greek rearguard, while suffering severely, could not retaliate at all ... the Greek javelin-men could not throw far enough ... Xenophon consequently decided that they must pursue the Persians, and this they did, with such of the hoplites and peltasts as were guarding the rear with him; but in their pursuit they failed to catch a single man of the enemy. For the Greeks had no horsemen ... Again, the barbarian horsemen even while they were in flight would inflict wounds by shooting behind them from their horses. (*Anabasis* 3.3.7–10)

Xenophon's response to counter the enemy horse archers was to create a band of slingers from Rhodian volunteers within his army, and a squad of cavalry from horses in the baggage train (*Anabasis* 3.3.13–17). Unlike Bronze Age battles, where archers were likely to decide the outcome, Iron Age armies needed to consist of composite forces. Each troop type had its particular advantages and disadvantages, and the commander's ability to use these troops where they were most effective often determined the outcome of a conflict.

In the East during the proposed transitional period, light chariotry was superseded by light cavalry. The chariot then developed into a heavier 'shock' weapon to break up mass infantry formations, which became better armoured during

the same period. It is likely that the scythed chariot was considered an effective weapon against massed infantry. This use of the heavy chariot was continued by the Persians until around the time of the invasion of Alexander the Great, who had no need for heavy chariotry; his heavy cavalry served the same purpose. Bosworth writes that 'the Macedonian cavalry was, as always, superb, and its discipline was sharpened by regular training which involved the classic tactic of attack in wedge formation.'⁴⁹ Cavalry was also cheaper to maintain and far more versatile than chariotry. The chariot was tactically limited to open fields of flat ground, whereas cavalry could operate on a much wider variety of terrain types.

The development of the horse archer rendered the chariot archer obsolete and the development of heavy cavalry had rendered the heavy chariot obsolete. The chariot no longer had a place on the battlefield as a tactical unit. Only in a few Celtic regions did the chariot continue to be used on the battlefield. For example, in Asia Minor in 278 BC, Celtic tribesmen fielded 240 chariots and fought against the Seleucid army of Antiochus I. During another battle three years later it seems that scythed chariots were used on both sides—they are depicted on carved reliefs commemorating the battle at Pergamum.⁵⁰ That the chariot remained in use on the continent for a few generations after the employment of Macedonian heavy cavalry suggests the difficulty involved in raising heavy cavalry shock troops, but within a fairly short period of time, heavy cavalry completely superseded the heavy chariot. It only hung on in the relatively isolated British Isles until the first century AD.

It can be seen that the demise of chariot warfare cannot be associated with the end of the Bronze Age. With the exception of Greece, the chariot remained an integral part of armies long after this time. As long as the majority of an army was unarmoured, the archer was able to dominate the battlefield, and it is evident that he did so until the 13th century. During the transitional period that followed, archery dominance declined as pitched battles between massed infantry became more common and these troops began to wear heavier body armour. The javelin emerged as a more suitable weapon since it was more capable of penetrating body armour and chariot-archers moved to horseback and became horse-archers. During this time the chariot evolved

into a 'shock' weapon designed to counter massed infantry formations. It wasn't until cavalry shock tactics were developed that heavy cavalry could supersede the heavy chariot, and from that point on, the chariot no longer had a tactical place on the battlefield. In the Bronze Age, archers and charioteers ruled the battlefield while, in the Iron Age, a greater mix of various units was needed.

Chapter 2

Weapons

Introduction

Probably the very first tools and weapons were simply objects found in nature. A tree branch became a club, a sharp stick became a spear, a rock became a missile or hammer, and a broken rock became a crude cutter. The Palaeolithic Period began about two million years ago when primitive humans first started fashioning their own tools rather than just using what came to hand. The earliest stone implements are known as Oldowan, or 'Mode 1' tools, and indicate the beginning of the archaeological record. The most suitable types of stone for tools include flint, chert, and obsidian since they are capable of forming a sharp edge—often sharper than a metal blade, but more brittle. Oldowan tools are classified into broad categories based on utility, such as 'cutter', 'pounder', 'scraper', and so on. They were made by 'knapping'—striking a large 'flake' off a suitable stone and then taking this flake and 'retouching' it by striking smaller flakes off it to create the desired shape. They are mostly 'unifacial' tools, in which only one edge of the stone was worked. The longest straight edge capable of being formed with this technology is only about a finger-length so utility was limited.

Eventually these primitive implements evolved into Acheulean, or 'Mode 2' tools, which are more sophisticated and varied than Mode 1 tools. They were knapped in the same way as Mode 1 tools but the 'core' was used rather than the flake that was struck from it. The shape of the core was refined using tools made of wood, bone, or antler with a technique called 'soft hammer percussion'. The bifacial 'hand axe' is the definitive Acheulean tool. The longest cutting edge capable of being created using Mode 2 techniques is three or

four times longer than Mode 1 tools, so utility is greatly improved. Acheulean tools were not specialized; the same hand axe might be used for chopping down a tree, cutting up meat, or splitting a bone. Because of this, no Acheulean tool can be properly defined as a dedicated weapon even though they were perfectly capable of injuring or even killing animals and humans.

The Upper Palaeolithic dates from about forty thousand years ago to about ten thousand years ago and is characterized by 'Mode 3' and 'Mode 4' tools. Mode 3 tools are made using a specific type of stone knapping called the 'Levallois technique'. It involves knapping the edges first, followed by the rest of the surface until it resembles a tortoise shell. The edge is then struck in such a way as to cause a large thin convex flake to split off from the top of the core. This technique gives much more control over the final shape of the object and can be used to create a greater variety of tools. It is here that specialized tools start to develop, including weapons. The Levallois technique can be adapted to make sharp points for spear and arrow heads.

Mode 4 tools are characterized by long parallel-sided flakes called 'blades'. When attached to a handle they became the first true knives. Other tools made with these flakes include end-scrapers, chisels, and awls. They were made using advanced knapping techniques such as 'indirect percussion', where a punch of some kind is used to concentrate the impact, or 'pressure flaking', where pressure is gradually applied rather than the swift impact of a hammer blow.

The Neolithic period is distinguished by 'Mode 5' or 'microlith' tools. A microlith is a small piece of sharp worked stone. Some types were embedded into grooves along the edge of wooden tools and weapons to provide a sharp edge. It is the easiest way for a stone-age culture to create a cutting edge of some length since a long length of stone is extremely fragile and difficult to fashion into a blade. The Aztec *macauitl* is the most widely recognized microlithic weapon but they seem to have been widely used by all Neolithic cultures in various forms. When used on a weapon, the microliths are susceptible to damage and will break off during combat. But they can easily be repaired by gluing in replacement pieces.

'Mode 6' tools are made by grinding against an abrasive stone with the assistance of water. Grainy rocks such as

basalt are good for grinding and a great many shapes can be created, but edges cannot be made as sharp as a knapped edge. Sometimes the edge is created by knapping and the tool is then finished by grinding. Ground tools represent a considerable investment in time to manufacture but these are usually more durable than knapped tools.

Copper and Arsenic

The Chalcolithic period is marked by the earliest use of copper tools. As noted in the first chapter (p. 3), copper metal can be found in its natural state and was probably the first metal to be worked by man. The earliest metallic weapons were close copies of stone versions but over time they developed unique characteristics.

Pure copper is adequate for maces and axes but is not so useful for blades. The pure metal is too soft and the edge easily becomes dull or damaged. Some of the earliest metallic blades found have been made from an alloy of copper and arsenic, which acts like tin to increase the hardness of the metal. This has led to speculation that arsenic was deliberately added to harden the metal and that ancient metalworkers may have suffered from the effects of arsenic poisoning. However, study of ancient smelting sites and the composition of local ores suggests that arsenic was not deliberately added. The local ores contain the same levels of arsenic as the finished weapons. It is likely that ancient metal workers simply smelted every 'green' ore that they could find (for some reason blue ores were rarely used) and that they kept the best results for making weapons. It just happened that those alloys that contained higher levels of arsenic were ideally suited for making blades.

Some items have been found with a lower arsenic content but that is more likely to be the result of recycling since re-melting the alloy will reduce the arsenic content. It may even have been a specifically-developed technique to deliberately reduce the arsenic content in order to produce the required mechanical properties. In any case, it still seems reasonable to argue that the earliest attempts to deliberately harden copper by alloying it with another metal involved tin and not arsenic. The best-known find of copper-arsenic weapons was at Arslantepe in southeast Turkey (see 'Swords and Knives', pp. 35–36).

Bronze Weapons

As previously noted, bronze is an alloy of copper and tin. By the Middle Bronze Age, the majority of weapons were made of some sort of bronze. Many archaeological reports state that weapons and armour dating to this time period were made of copper but that is misleading since it is impossible to tell the difference between corroded bronze and copper without a metallurgical analysis. If this hasn't been done then the best one can say is that these items were made of 'copper alloy'—leaving the exact composition of the metal unspecified.

Bronze Age weapons could contain anything from 2 to 15 per cent tin; the higher the tin content, the harder the alloy. The optimum amount of tin for a blade is considered to be 7–12 per cent.¹ As bronze is worked it becomes harder, which can improve performance if done correctly. Generally the centre was left relatively soft while the edges were work-hardened. During the hammering process it is necessary to anneal the metal by heating it and quenching it quickly in water. This is by contrast with iron, which requires gradual cooling to anneal it. While bronze can be just as hard as later ferrous swords, it does have some disadvantages. It isn't as flexible, so longer blades are more liable to bend or break during combat. Bronze doesn't hold an edge easily either; during combat the edge can become dull, or it can roll or chip, so edge angles are generally not as acute as a well-made ferrous sword to reduce the likelihood of damage.

Clubs and Maces

One weapon that seems to have been uniquely suited for use against humans is the club and its more advanced variant, the mace. Bludgeoning hand weapons were of little use in hunting. The larger animals that humans hunted had thick skulls that were highly resistant to concussion attacks. Spears were far more effective against these animals, and smaller game was dispatched with slings and bows. It is likely that the club was the first weapon to be designed primarily to be used against humans, since our thinner skulls leave us far more susceptible to head wounds. Maces and clubs were probably why the helmet was one of the first

pieces of armour to be developed.

A club is a lump of wood with most of its weight at one end, while the other end is fashioned into a hand grip. A mace is similar in design except that the head is made of a material that is denser than wood, such as stone or metal. In order to be effective, the mace head needs to be both dense and tough. Many types of stone are too brittle and liable to crack or shatter upon impact. Over time people learned which types of stone were more suitable for mace heads. Some examples include basalt, jade, dolomite, diorite, marble, alabaster, and so on. Sometimes they were coated in bitumen to reduce the likelihood of cracking.

Many mace heads were roughly spherical in shape, but there were other designs. One that seems unique to Egypt is the 'disc' mace. As the name implies it was circular in shape with a hole in the centre for the haft (see 'Egyptian Weapons', pp. 46–47). A variant of this design is one with a triangular section. Its greater mass helps it deliver more damage whilst making it less likely to break than the disc-shaped head. An early stone triangular mace head was found at the Neolithic site of Hallan Çemi Tepesti.²

A modified spherical mace with a rounded pear shape is known as the 'piriform' mace. This mace head's centre of gravity is moved further to the top of the weapon, which improves momentum during a swing. It started to see use during the Naqada II period of pre-dynastic Upper Egypt (3650–3250 BC) and continued to be used in the Naqada III period (3250–3100 BC). During the last half of the third millennium they also saw use in Mesopotamia. One elaborately decorated example was found in the Temple of Horus in Kom El-Ahmar at Hierakonpolis and is attributed to Narmer of the Early Dynastic Period (thirty-second century). The 'Narmer Palette', found on the same site, shows the Pharaoh smiting an enemy with this weapon.

Vertical fluting was an early attempt to put flanges in a spherical or piriform stone mace. The raised ridges around the mace head helped to concentrate the impact. One was found at Tell Agrab, dating to c. 3000 BC. The knobbed mace was a more effective variant. Pieces were carved from the stone leaving pronounced knobs around the striking surface. Knobbed maces tend to be smaller in size than many other types of mace, suggesting that this design may have enabled similar damage to be delivered with less mass. It was a very

long-lived and successful design being replicated in iron as late as the Middle Ages.

Copper starts being used for mace heads in the Chalcolithic period. The earliest copper weapon ever to have been discovered is the mace head found at the city of Can Hasan in southern Anatolia, and dating to the late sixth millennium. The mace head, currently on display in Ankara's Museum of Archaeology, is now believed to have been made from a hammered piece of native copper, not smelted as initially thought. Other early examples were found at Tell Abu Matar and Nahal Mishma. Most early copper mace heads are copies of stone maces. It is only later that the different properties of metal were exploited to make more effective bludgeoning tools.

Copper mace heads were usually smaller than their stone brethren because of the metal's greater density. Being able to cast copper in a mould enabled a greater variety of shapes. Some were fashioned in the form of animal heads or the heads of fantastic creatures. One was a 'truncheon' type mace with a head that was elongated into a cylinder; some bulged out a little near the top. The knobbed mace was modified so that each knob was conical or pyramidal in shape resulting in blunt points all around the striking surface. A more advanced design was the 'flanged' mace which combined the knobbed mace with the striking edge of a disc mace; the knobs were replaced with protruding vertical flanges around the striking surface, but this design was more common in later iron maces.

There is a mass grave of sixty soldiers killed in battle at Deir el-Bahri dating to the reign of Mentuhotept I (2061-2011 BC). Winlock concluded that fifteen were killed by maces and another eighteen were killed by hurled rocks, though some injuries could have been caused by either. The rest were killed by arrows or exposed after the battle.³

A quantity of mace heads were excavated from the cemetery at Marlik in Luristan (western Iran) and dated to the last half of the second millennium BC. Mace heads were only found in nine of the fifty-three graves here and all of these seem to have been of the nobility. While dating fairly late in the Bronze Age they suggest that a typical mace was far lighter than many have assumed. The measurements of some of them are as follows:⁴

<i>Description</i>	<i>Length</i>	<i>Diameter</i>	<i>Weight</i>	<i>Haft hole</i>
Limestone 1	10.5cm	8.0cm	670g	1.7cm
Limestone 2	9.0cm	6.8cm	511g	-
Limestone 3	8.0cm	5.8cm	372g	2.0cm
Hematite	6.1cm	4.4cm	272g	1.0cm
Bronze Globular (Cat. 321)	18.5cm	8.7cm	828g	3.5cm
Bronze Globular (Cat. 320)	11.7cm	7.2cm	616g	2.0cm
Bronze Knobbed (Cat. 325)	7.5cm	6.7cm	289g	2.1cm
Bronze Truncheon (Cat. 319)	22.0cm	2.8cm	235g	2.3cm
Bronze Truncheon (Cat. 322)	18.0cm	4.8cm	816g	2.8cm
Bronze Truncheon (Cat. 323)	17.5cm	3.5cm	624g	1.8cm

Throwing Sticks

A throwing stick is basically a short club that has been shaped for throwing. They were probably in use for as long as regular clubs. Like a club, one end is often heavier than the other. This gives greater momentum to the throw and improves stability during flight. They can be straight like a regular club or curved, and often the points were thinned down to help concentrate energy upon impact. Many were multi-purpose, serving as a ranged weapon and as a short club for close-quarter combat. They could also be used as a digging tool, a percussion instrument, and a fire stick. Most throwing sticks are aerodynamically designed to fly swiftly and accurately, directly towards a target, but some were designed to return to the thrower. These were asymmetrically shaped with an airfoil on the upper surface, and had a curved trajectory in the air. Australian Aborigines are famous for these boomerangs but other cultures made use of them also. Their only real purpose in hunting is to flush game, frightening the animal and hopefully causing it to run closer to the thrower or one of his companions.

Both types are thrown sideways and they spin, end over end, in the air. There are two contradictory principles that are required to make a throwing stick. A light, thin stick is required to produce a long, stable flight, while a solid, heavy stick is required to deliver significant impact. It requires a careful balance between the two principles to produce a weapon that can both travel a decent distance and deliver

damage to the target at the end of its flight.

Throwing sticks are mentioned in Sumerian texts and many of the weapons that have been erroneously identified as 'sickle-swords' (see p. 34) are more likely to be curved throwing sticks. The Egyptian 'Hunter's Palette' shows one warrior wielding a spear and a throwing stick. The weapon was gradually superseded by slings and bows but it hung on in some primitive cultures.

Slings

Favoured by animal herders, the sling was used to ward off predators and to encourage strays to return back to the flock. They were also used against fellow humans. The weapon consists of two lengths of cord with a pouch or cradle in the middle. A stone is placed in the cradle and the ends of both cords are held in one hand. The cradle is twirled horizontally above the head a number of times to build up momentum and then one of the cord-ends is released, enabling the stone to fly towards the target. The sling is small and portable (it could be worn as a belt) and ammunition was readily available. Anyone who used a sling was constantly on the look-out for suitable pebbles to use as ammunition. It would have been discovered that evenly shaped stones flew longer and more consistently than irregularly shaped ones and that the time involved in seeking out and collecting suitable stones could be better spent making one's own ammunition. Baked clay sling shot is ubiquitous at battle sites in the Neolithic and Early Bronze Age and continued to be used by various cultures into the Middle Ages. Early shot was spherical in shape and later it became more egg-shaped or 'biconical' (ovoid with pointed ends).

Most scholars are confident that the sling was in use at least as early as 6000 BC but some argue for it being used even earlier. Arther Ferrill, for example, claims that the sling was introduced between 8000 and 12000 BC.⁵ There are few surviving slings from the Bronze Age. Two of the earliest were found in the tomb of Tutankhamen.

Thom Richardson has made a detailed study of a later Egyptian sling found at El Lahun in Fayum, dating to the eighth century BC.⁶ It is currently in the Petrie Museum in

University College, London (no. UC.6921). The sling is not complete. Only the cradle and one cord are intact; both are made from braided flax. The cradle is 125 × 70mm, and the cord is 570mm long. Assuming that none of the surviving cord is missing, the total length of the original sling would have been around 1270mm. Richardson made several copies of this sling and experimented with them. Each was 1450mm in length and weighed 45g. He discovered that when stones were used, the results were very inconsistent, even when shooting stones of the same weight. The average range for stones weighing 45–75g was 90m, while the range for stones weighing 80–85g was 84m, and the range for stones weighing 85–160g was 82m. With lead shot, the results were far more consistent. Two types were tested: one was spherical ('ball') and the other was more almond shaped ('shot'). The 38g balls averaged 114m and the 100g balls averaged 107m. The 40g shot (29 × 18 × 13mm) travelled 145m on average and the 85g shot (39 × 22 × 16mm) averaged 120m. Overall, lead outranged stone by about 50 per cent. This is not surprising since a lead projectile is significantly smaller than a stone of the same mass and so has much less drag.

Richardson did ballistic testing of some of his shots and recorded the speed at a distance of 3m from the point of release. It was discovered that the speeds were very consistent. The 80–100g stones averaged 30.3m/s, the 100g lead ball averaged 30.5m/s, the 40g lead shot averaged 30.6m/s, and the 85g shot averaged 31.2m/s. Unfortunately he didn't test baked clay shot, which was a common ammunition for slings in the Bronze Age. Because of their more regular shape it is likely that they would have outranged stones of a similar mass by a small margin and accuracy would have been improved.

The Bow

The bow is one of the most effective tools of war ever devised until the invention of firearms. Its light weight made it reasonably portable and its dual-purpose use for both hunting and warfare, without exposing the wielder to immediate danger, made it an invaluable weapon for many cultures. Compared to the throwing spear, a man could carry ten times as many arrows, thus greatly increasing the volume

of fire directed at an enemy. In addition, each arrow had a much greater range, though it lacked the penetrative power of a javelin.

The first possible evidence of the bow being used in warfare comes from Neolithic cave paintings; there are examples at Morella la Vella and Les Dogues in Castellón, Spain. In the Bronze Age, the bow was used to shoot volleys at the enemy. Large numbers of archers would stand behind shield bearers and attempt to break up the enemy shield wall or to attack a fortification.

The bow is man's first successful attempt at concentrating energy. Mechanically, it is just a two-armed spring. The string spans it and puts it under tension. When an arrow is placed on the string and pulled back, energy is stored in the arms (limbs) of the bow. As the bow is drawn, the outer curve ('back') undergoes tensile stress while the inside curve ('belly') is placed under compressive stress. The timber used for making the bow must be able to simultaneously handle both of these stresses. Releasing the arrow transfers the energy from the bow into the arrow, which then flies towards its target.

During the Middle and Late Bronze Age, arrowheads were still being made of stone but bronze was becoming more common. It is at Knossos that some of the earliest socketed bronze arrowheads were found.

There are two main types of bow and they are distinguished by the material from which they are made. A 'self bow' is made entirely of timber. It can be made with some fairly basic woodworking tools. Pretty much any timber can be used to make a bow if it is long enough and the grain is fairly straight, but some types of timber are more appropriate than others. Dense timbers tend to store more energy than lighter timbers. Yew is particularly suitable because its heartwood is resistant to compression while the sapwood is resistant to tension; it has been used for bows in Europe since the Mesolithic period. Self bows have to be long: ideally the same height as the user or a little longer. Long limbs reduce the amount of stress per square centimetre and allow more energy to be stored. An elastic material such as sinew can be glued along the back to help accommodate this tension (creating a 'reinforced bow') and thus reduce the overall length of the weapon.

A warbow needs to be heavy in order to inflict damage with war arrows at battlefield distances; this requires upper body strength and years of practice to master. Attempts were made to improve the effectiveness of the self bow. The 'double-convex' configuration brought the ends of the limbs closer to the centre, increasing its efficiency. Reflexing was another method: when unstrung the limbs bend back the other way; when strung, these reflexed limbs become preloaded with stress, enabling more energy to be stored in the bow when it is drawn. Yadin notes that early Bronze Age illustrations show two main types of bow: the Egyptian bow, which was double-convex in shape, and the Mesopotamian bow, which was single-arc.⁷

When suitable timber was unavailable, alternative materials were substituted to create a laminated construction. The 'composite bow' was made by gluing different materials together, namely animal horn and sinew. Horn can handle a compressive load up to twice that of bow wood (and can better return to its original shape) and sinew was far more resilient with a tensile strength around four times that of bow wood.⁸ Sometimes these were glued onto a wooden core but other variants used no wood at all. The resultant 'horn bow' was far more efficient than a self bow enabling shorter weapons to be constructed with similar draw length, which was ideal for mounted archery. The lighter limbs enable energy to be transferred more efficiently into the arrow.

Composite bows are always reflexed. The type of glue used in this construction is critical; it needs to be flexible, while achieving a very strong bond. Usually animal or fish glues were used and there were many recipes; some were carefully guarded secrets. The composite bow was susceptible to moisture and so had to be carried in a case, but it could be strung for longer periods than a self bow without 'taking a set' (i.e. stiffening in one position).

Very few Bronze Age bows survive so one must largely rely on depictions. One visual characteristic that distinguishes a composite bow from a self bow is the tendency of the limbs to recurve near the ends and then become straight in the centre near the grip. The appearance of this feature on Bronze Age depictions is used to try and determine when the composite bow first came into use. The earliest illustration to show this characteristic is the victory monument to the Akkadian King

Naram-Sin (twenty-first century), the grandson of Sargon the Great. His weapon looks like a composite bow, being shorter in length and having recurved ends with a straight middle section. The composite bow is evident in the Levant by the nineteenth century and introduced into Egypt by the Hyksos a century later.

Most of the evidence for Bronze Age composite bows comes from the tomb of Tutankhamen. Thirty-two composite bows were found along with fourteen self bows and 430 arrows. According to Wallace McLeod, the hardwood (typically ash) core of a composite bow was about 15mm thick, in a single strip or several spliced strips, with horn glued to the belly and sinew glued to the back, and most were covered with a bark 'sheath', usually of birch.⁹ McLeod sorted the Egyptian composite bows into groups based on length. The most numerous by far were 1.07–1.16m in length. The longest was 1.4m and the shortest was only 0.34m; the latter has often been described as a 'toy'. For comparison, three of the self bows found in the tomb were over 1.9m in length.¹⁰

Egyptian bows, both self and composite, have an inward bend at the grip, producing the distinctive double-curved profile of the self bow. When strung, Egyptian composite bows bend inward creating an internal angle and giving a triangular profile to the weapon. This triangular typology was to continue in use by various cultures until the sixth century BC. However, not all Egyptian composite bows were triangular. The bow of Amenophis is described as a 'one-curve composite'. Recreations by Edward McEwen and his collaborators demonstrate that the triangular composite bow was very efficient.¹¹

The angle at the centre is inflexible, and the bow actually bends throughout the length of the limbs. Releasing the bowstring produces no kick, which results in a smooth, accurate shot. The extremely long draw length, reaching 101 centimetres with the limbs under maximum tension, would have provided a greatly enhanced cast compared with that of the second-millennium B.C. self-bows.¹²

Tom Hulit and Thom Richardson tested a replica Assyrian composite bow against scale armour reconstructions.¹³ The bow was made by McEwen and was an angular composite bow similar to the ones used by the Egyptians. Like some of the examples found in Tutankhamen's tomb it was made of laminated wood, sinew, and horn and covered in birch bark. It had a length of 1.455m (1.420m when strung), and a draw weight of 18–20kg at a draw-length of 760–840mm. Both archers consistently shot replica Egyptian arrows to a range of 100–150m. The arrows were made by three different craftsmen (McEwen, Waller, and Hulit) of cane with a hardwood foot and several different types of bronze or ebony arrowhead. Four different arrows were summarized in the following table:

	<i>Overall (mm)</i>	<i>Shaft (mm)</i>	<i>Foot (mm)</i>	<i>Head (mm)</i>	<i>Weight (g)</i>
McEwen	930	735	140	55	54
Waller 1	995	775	150	80	76
Waller 2	1020	800	150	80	80
Hulit 1	955	775	100	80	64

Three main types of arrowheads were used: a long, tapered ebony 'bodkin'; a generic bronze arrowhead; and a bronze arrowhead modelled on the ones found in Tutankhamen's tomb. The alloy was fairly hard to begin with, being made of 88 per cent copper, 10 per cent tin, and 2 per cent zinc, but the arrowheads were then worked to increase hardness even more. (For a summary of how well the armour performed against these arrows, see 'Defensive Capability of Bronze Age Armour', p. 84.)

Axes

An axe is a heavy wedge with a sharp edge. The earliest ones were chopping tools made of stone and held in the hand. Later they were lashed to a long handle to improve their utility. It has been said that early metallic battle axes were adapted from domestic tools such as wood-cutting axes. This does not make sense when considered in the proper context. Copper was an expensive material; early in the Bronze Age it was only owned by the elite and later on it was controlled by

the state and issued to troops. Even though metal axe heads would have been better than stone for cutting timber, who were the people who performed this labour? A member of the fighting elite would not have performed manual labour and the lower class workers during the time in question did not have metal tools. The first metal axes may have been *modelled* on domestic stone axes, but the metallic versions were probably developed *specifically* for combat, and never intended for household chores at all. The same reasoning can also be used to dismiss the possibility that the Egyptian khopesh was adapted from a farming sickle (see ‘The Khopesh’, below). The earliest copper tools were probably controlled by the state and issued to approved workers for state-sanctioned projects. It isn’t until later in the Bronze Age that copper became plentiful enough to start being dispersed amongst the lower classes.

The earliest axes are called ‘flat axes’ and are similar in shape regardless of whether they were made of stone or copper-alloy. They were fitted to the haft by ‘wedging’; the haft was split at one end and the axe was wedged in tightly and lashed in place. The earliest copper-alloy axes come from a hoard of fifty-five examples found at a burial site in Susa, south-western Iran, and dated to the late fifth millennium. Over time these developed proper tangs, which can be fixed more firmly into the haft.

The invention of the socketed axe has been attributed to the Sumerians. The earliest examples were found in the cemetery of Ur and illustrated on the Stele of Vultures. The earliest sockets were just an extension of the back of the axe that was wrapped around so that it could be slipped over the haft and held in place either with rivets through the side or a wedge in the top. Later axe heads were specifically cast with the blade and socket in one piece. The Sumerian axes had a profile similar to a duck’s bill and seem more suited for piercing than cutting attacks ([fig. 1](#)).

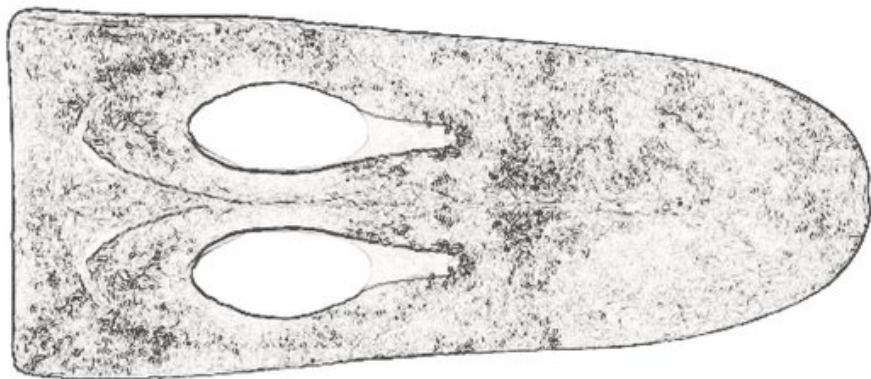


Figure 1. *Profile of a 'duck's bill' axe head.*

There is an example in the British Museum that was found in one of the 'Royal' graves of Ur. The original haft had disintegrated but the red gesso and gold decoration was intact. This enabled a new haft to be reconstructed. The final length of the weapon was around 47cm with a head of about 13cm including the socket. There were similar variants that were long and narrow but didn't have the distinctive 'duck bill' shape. One type used in Anatolia is referred to by Yadin as 'double bladed' because it has a secondary, smaller blade on the back of the socket. He believes that its primary purpose was to add weight to the swing when attacking with the primary blade,¹⁴ but it could also be turned around to serve as a back-up weapon if the primary edge was damaged. This addition is seen on some medieval battle axes except that the secondary blade is more often a spike to help punch through heavier armour.

The piercing axe seems specially optimized for punching through skulls and armour; the only armour at the time was in the form of helmets, so it is likely that the head was the primary target for these weapons. This is corroborated by skeletal evidence. The mummy of 17th Dynasty (c. 1575 BC) ruler Seqenenre Ta'o II has skull damage consistent with this weapon.

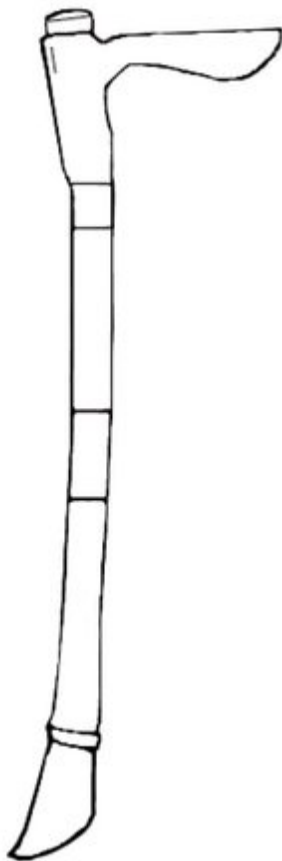


Figure 2. *A socketed 'piercing axe' found at Ur.*

Tom Hulit tested the performance of several Egyptian piercing axes against some scale armour reconstructions and found that, although the scales themselves were severely damaged, the layered linen backing prevented penetration (see 'Defensive Capability of Bronze Age Armour', p. 84).

The other main type of axe is the 'epsilon axe'. It is so called because the profile of the blade looks like the Greek letter of that name. The blade was available in differing widths; some were quite deep, better for chopping, others were shallow and more suited for slicing ([fig. 3](#)). The blade has three tangs that are inserted into the side of the haft and fastened either with lashing or rivets. A similar variant was called an 'anchor axe' because of its shape; the head had a long central tang and this was the only attachment point to the haft. The Assyrians had a smaller version of this weapon,

which differed in one respect: the back of the blade wasn't tanged, but wrapped around into a socket that fitted over the end of the haft. Another **figure 2**. A socketed 'piercing axe' found at Ur. version is longer and its profile looks very similar to the top of a duck's bill ([fig. 2](#)). Most of these weapons were intended to be used against unarmoured parts of the body since they are unsuited for penetrating helmets or body armour. It is likely that the epsilon axe was the ancestor of the khopesh (see below). Cutting typologies were more common in Egypt, but they also used piercing axes.

The Khopesh

The khopesh is a strange weapon, resembling an intermediate between an axe and a sword. The haft and blade is made entirely of metal; it is straight until the last half of its length, where it sweeps out into a curved cutting edge. It could be considered an ancestor of the falchion, a heavy chopping sword; early examples include the *kopis* and *falcata*. The term is Egyptian (*kh.p.sh* = 'knee') but examples have been found throughout the Middle East. It first appears early in the second millennium. One of the earliest depictions is on a Mari cylinder seal.

It is thought to have originated in Canaan. One early version comes from Lagash and dates to the late third millennium. Others have been found at Byblos and Shechem dating a century later. Early examples are tanged and the grip is fastened with glue or rivets. Later examples have a flanged hilt with organic inlays (timber, bone, ivory, etc.) for the grip. The khopesh eventually replaced the mace as the symbol of Egyptian authority. Rameses II is the first Pharaoh to be depicted wielding it in battle.

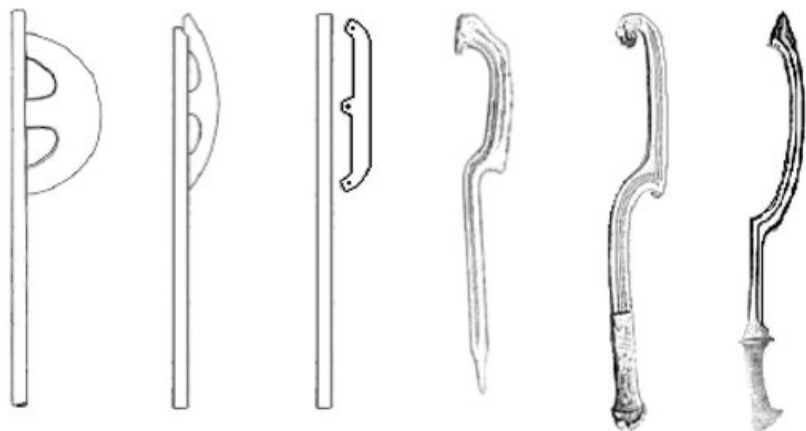


Figure 3. *The khopesh, showing the probable evolution from the epsilon axe (not the sickle).*

The hilt and blade are cast in one piece giving the khopesh great strength. Most surviving examples have a fairly thick cross-section and seem too heavy to be used effectively in battle, though it is uncertain how many of these were intended for actual use since many are unsharpened. They are typically 500–650mm in length, though some are short enough to be classed as knives. A khopesh light enough to be effective in combat would weigh 650–750g. Generally, the tip is in line with the hilt which maintains proper balance and helps accuracy when thrusting. The inside curve of the weapon forms a hook that can be used to trap an opponent's arm, or to pull his shield out of the way.

The khopesh has commonly been called a 'sickle-sword' (see below) but there are several reasons why this term is inappropriate. A sickle is sharpened on its inside (concave) edge while the khopesh is sharpened on the outside edge; all of the illustrations depicting the khopesh show it being used to cut with the outside edge, not the inside. The shape of the grip also makes it very difficult to use with the inside edge facing away from the wielder while it fits comfortably in the hand when turned around. It could not have evolved from a farming sickle either, since early Bronze Age sickles were made, not from bronze, but by embedding microliths in wood. In fact, there are enough surviving weapons of this type to show a definite evolution from the epsilon axe ([fig. 3](#)). Early khopeshes are very similar in shape to this axe, except that

the haft is metallic, rather than wooden.

Sickle-swords

These weapons are defined as having a curved blade that was sharpened on the inner or concave edge, just like a sickle. There are a few Iron Age examples, such as the *rhomphia* and the *falx*. It is alleged that this weapon was invented in the middle of the third millennium and various depictions are used as supporting evidence. It has already been noted that sickles of the time were not made of metal and this weapon could not have been adapted from a farming tool. There are plenty of examples of sickles dating later in the Bronze Age when the metal is more widely available to the lower classes, but not a single one has been found in the archaeological record dating before the Late Bronze Age.

In addition, all of the iconographical evidence is very ambiguous in nature. The most commonly cited example is the object carried by King Eanatum on the Stele of Vultures. He is shown carrying this item in two different scenes and both times it is incomplete. In the upper scene, the top of the object is missing, and in the bottom scene, the top is damaged. In fact, it could be a whip or reins for the animals pulling his wagon; whips are clearly depicted on other illustrations showing these vehicles. It could also be a sceptre or mace. The only weapon so far found that remotely resembles the object being held in these illustrations is the curved throwing stick (see p. 26) and if a weapon is being depicted, this is the most likely candidate. The sickle-sword, as it is properly defined, does not see use until the Iron Age.

Swords and Daggers

Swords are normally differentiated from knives by length, but this distinction seems quite arbitrary. One weapon could be called a 'short sword' and another a 'long knife', while both could be of exactly the same length. The term 'dagger' will be used here to denote a double edged short blade (less than 300mm) primarily used for thrusting in combat. Anything longer will be called a 'sword'.

One of the earliest metallic daggers ever found was at Kültepe in Iraq and dated to the middle of the fifth

millennium. It is triangular in profile, 3-4cm in length, and made of copper-alloy. Most metallic blades up to the middle of the third millennium are of this type: elongated triangles worked from a flat plate of copper-alloy, with a short tang that is glued or riveted onto a hilt. Some don't have tangs at all; instead, the straight back end was wedged into a slit in the grip and glued, lashed, or riveted in place. Some have a reinforcing midrib and work-hardened edges. They can be found in most areas during the Early Bronze Age period and served as weapons and multi-purpose tools. At the end of the Bronze Age, the most common dagger type was the same shape as the most common sword, the Naue Type II (see below), and were starting to be made of iron by this time.

Swords are different from daggers. Barry Molloy writes that daggers are close-quarter weapons that utilize both the point and the edges in combat. They are more suited to individual combat than formation fighting. He stresses that a sword is not just a longer dagger. It was developed for an entirely different style of fighting and these longer blades required a more advanced level of metallurgical expertise than daggers.¹⁵ Unlike a dagger, which can have nonmilitary purposes, a sword is designed primarily for combat.

Warfare usually involves formations of men—the spear and bow are the principal weapons in this situation. The sword, like the axe, is a secondary weapon since each is unsuited for use in a dense formation. It is used when the spear is lost or broken, or when the formation has lost cohesion. It may even have been used in single combat between champions before battle commenced. All but the latest swords at the end of the Bronze Age seem to have been intended to be used in conjunction with full-height shields. It has been speculated that some of the earlier swords were only capable of thrusting, like a medieval rapier. It will be shown that this is not the case. All swords are capable of cutting and thrusting but some designs favour one type of attack over another. It should be noted that various types of armour had no influence at all on the development of different types of sword, since it is not possible for any kind of sword to cut through any kind of armour—not even linen or leather.¹⁶ The sword must therefore have been used to target the unarmoured parts of the body.

Some of the earliest swords so far uncovered were found in the palace complex at Arslantepe, in the Taurus Mountains of

southeast Turkey. A number of swords, spearheads and other metal items were excavated in the so-called 'Hall of Weapons' where they had been sealed in the collapse of the building; this event has been carbon-dated to the end of the fourth millennium. As noted above, most blades at the time were simple elongated triangles with a separate hilt. The Arslantepe swords are unique in two ways: the first is that the blade and hilt are cast in a single piece; and the second is that the edges have a very narrow bevel. These traits are typically found on blades dating five hundred years later, from the middle of the third millennium. One of the excavators has noted that 'the area where the weapons were found did not seem to have been disturbed after the destruction and collapse of the walls'.¹⁷ Were it not for the fact that the stratigraphy was secure, we might suspect that such advanced swords were a later intrusion into an earlier layer. The Arslantepe swords are 45–60cm in length and weigh 200–300g. A modern reconstruction weighs closer to 500g (see colour plate).

There are many different types of swords and very few are limited to only one culture. The largest variety and best-studied group is in the Aegean and this is the typology that will be outlined here. It was created by Nancy Sandars in 1961,¹⁸ and amended by Jan Driessen and Colin MacDonald in 1984.¹⁹ A second typology was created by Imma Kilian-Dirlmeier,²⁰ which pays more attention to the horned variants than Sandars' typology, though it is difficult to tell the difference in many cases. Molloy has a chart cross-referencing the two systems,²¹ and Kirk Lee Spencer has now combined both typologies into a single set of diagrams. These are included in this book. The following section will use the Sandars' system, since her typologies have a chronological progression (Type A is the earliest and Type G is the latest) and seem more intuitive to follow.

The limited number of bronze swords that have been found in the archaeological record can give a distorted view of the weapon's prevalence. For the Aegean, we have the Linear B records from Knossos, which list large numbers of swords,²² in stark contrast to the mere twenty-four physical examples that have survived from all periods in this area.²³

One of the earliest Aegean swords was found at Naxos and dated to the middle of the third millennium. It isn't much longer than a dagger (35.6cm) and is dagger-shaped with a

triangular profile and a central midrib. It is usually classed as a dagger, not a sword. The first true Aegean sword is the Sandars Type A, which is a long, slender blade, up to a meter in length or more, with a short tang upon which to attach a hilt. Rivets were used to secure the grip, two through the rounded shoulders and one to three through the tang; but it will be shown below that this isn't the principal method of attaching the grip to the hilt. Examples were found in Aegina, Amorgos, Crete, Thebes, and mainland Greece, and most date to the Middle Helladic II Period (c. 2100–1550 BC). The earliest was found at Mallia on Crete, where it is believed that this sword was first invented. The Mallia sword, dating from the Prepalatial Period (2600–1900 BC), doesn't seem to be a functional weapon, however, and may not have been intended for combat. One of the longest examples measures 1.16m in total and was found at Zafer Papoura, also on Crete.

Many examples were also found in Mycenaean grave shafts. (These were first categorised by Karo as Type A and Type B, a classification adopted by Sandars.) These slender blades were reinforced by a pointed midrib and the weight is forward, suggesting that it might have been designed for cutting as well as thrusting. However, the medial ridge along the centre prevents a deep cut. The medial ridge not only improves stiffness in the thin blade, but assists in the casting process: long, thin blades are very difficult to cast and the midrib would have helped the molten metal run along the entire length of the mould. A Minoan seal ([fig. 4](#)) shows how the sword may have been used in combat by thrusting the long blade over a large shield into the opponent's face or throat. The weapon may have been specifically designed to counter the large full-height shields that were commonly used at the time.

The Type B is similar in shape but shorter and stouter, though longer variants were similar in appearance to the shortest Type A. They have a more pronounced tang than the Type A and have wider square shoulders. This helps secure the grip and also moves the centre of balance back closer to the hand. Three rivets secured the grip on the tang and three rivets secured it at the shoulders. Length can vary from a long dagger (310mm) up to a short sword (550mm) but a small number are longer than this (up to 830mm). Its shorter length means that it has less reach with the point than the

Type A but is also less susceptible to breaking.



Figure 4. *Minoan seal showing a warrior wielding a Type A or Type B sword attacking an opponent with a full-height shield.*

Most Type B swords come from Mycenaean grave shafts. Schliemann reported one grave containing five bodies and forty-six swords, while another had three bodies and ninety swords. It is unlikely that these people actually owned all of these swords; more probably they were votive offerings rather than battle trophies since few showed any signs of combat damage. This type of sword isn't just found in the Aegean. Similar swords have been found as far away as Ireland. A Hittite version was found at Hattušas and dated to the late fourteenth century. This local variant has several less pronounced ribs rather than a large central one. Given the disparity in size between Type A and Type B and the fact that both were in existence at the same time, it is unlikely that the latter superseded the former. Indeed, it is possible that one fighter occasionally carried both types and used them for different purposes.

Reconstructions of Type A and Type B swords weigh less

than 500g, even when hilted. The tangs taper sharply from the shoulders where the thickness is c. 5-6mm to less than 2mm at the butt. The rivets attaching the grip to the hilt go through the thinnest part of the tang. Many have considered this a design flaw and use its apparent fragility to conclude that these swords can only be used for thrusting. Practical experimentation by Molloy, however, has demonstrated that this is not true. Using his reconstruction, he made successive cuts against tatami mats, a pig carcass, and several types of armour with no damage to the hilted area. In addition, he reasonably argues that if the thin tang had been a problem, then it would have been a simple matter to make it thicker, so the swordsmith must have had a very good reason not to do this. Molloy shows that the rivets are not the primary means of attaching the grip at all:

Given the wedge shape to the butt of these weapons (terminating in that very thin section noted above), we can begin to see a purpose to this design when it comes to the practicalities of establishing a firm hilted mechanism. A cut slightly narrower than the shoulder thickness of the butt of the blade would have been cut into the base of the handle. This would have been wide enough that the thin base could fit in easily, thus the graduating expansion of the butt would have allowed the bronze blade to be wedged firmly into this slit in the handle. Thus a firm friction grip is formed, which may have been augmented by glues or resins.²⁴

One unusual type of sword that existed at the same time as the Type A and Type B is the single-edged cleaver (Type I). These have been found mainly in the Peloponnese, particularly at Messenia and Mycenae. This solid blade resembles a modern machete and is intended for chopping rather than slicing, though it still has a thrusting point. The Type I sword is split into two subgroups based on the handle. Some have a flange over a wooden plate that rests on the tang. The rest have a solid handle with a ring on the end,

probably for a wrist strap. Molloy's tests against pig forelegs indicate that it was capable of cutting through flesh and into the bone, but it could not sever bone.²⁵ This cleaver is illustrated in Stele V from Grave Circle A at Mycenae (fig. 5); the charioteer has a Type A or a Type B sword but the foot soldier in front has a Type I sword. This style had disappeared by the end of the Late Helladic I period.

The Type C sword has the same tapering profile and pronounced reinforcing midrib as the Type A and Type B, but it is distinguished by a 'horned' hilt, with two short quillons protruding back at an angle. Kilian-Dirlmeier classes this as a 'horned sword' ('Hörnerschwert'). It also has 'flanges' around the tang, shoulders, and quillons, which strengthen the hilt attachment, preventing it from coming loose. The Type C is divided into two subcategories, Types Ci and Cii. The latter has no rivets in the grip, supporting Molloy's suggestion that grips were secured with wedges and adhesive, and most examples, unlike Type Ci, lack a pommel tang, while the midrib is less pronounced. Type C swords are generally shorter than Type A and narrower than Type B, and have been found throughout the Aegean. Similar variants have also been found in the Levant, Northern Italy, and Central Europe. It is possible that this sword was an attempt to combine the features of both Type A and Type B into one weapon. Lengths vary from 600 to 900mm, and a typical weight would be 500–700g.



Figure 5. *Stele V from Grave Circle A at Mycenae.*

Sandars splits Type D swords into two subtypes: Di and Dii. Type Di is similar to a Type C except that the quillons have been replaced with rounded knobs. It is generally short and sturdier than previous types. Type Dii has longer knobs that resemble a 'T' in profile. Kilian-Dirlmeier classes these as 'cross swords' ('Kreuzschwerter'). This enlargement of the base of the hilt enables a pommel to be attached. The other significant difference is that the midrib is reduced considerably or removed completely, so that the section of these blades looks like a flattened oval with pointed edges. This enables much deeper cuts since the midrib is no longer an obstruction. The Di is longer, usually 600–700mm, while the Dii is almost always less than 450mm, and a typical weight would be 250–400g.²⁶

Sandars' Type E is more properly classed as a dagger. It is similar to Type Dii in that there is no midrib, and the cross-section looks like a pointed, flattened oval. Its wide blade gives it enough mass for a solid cut. A typical length is around 300–400mm.

Type F, like Types C and D, is separated into two subtypes. Fii is the more common variant. It has the pointed oval cross-section of a Type E, parallel edges, and a point that is less acute than earlier blades. The sword is more solidly made with square shoulders and a T-shaped pommel (Kilian-Dirlmeier's 'Kreuzschwert'). Type Fi is similar except that it doesn't have the T-pommel. These swords are usually 400–450mm in length but some can exceed 500mm. Like the Type D they are excellent cutters, being well balanced and solidly built, but their broad point makes them less effective as a thrusting weapon.

Type G is, again, separated into Gi and Gii subtypes. Molloy believes that the Type Gi is the successor to the Type C. It has a midrib, though it is narrow, and the blades are wider, enabling a deeper cut before the midrib interferes.²⁷ It has short quillons but they are not angled back like the Type C. The Type Gii is rarer than the Type Gi, and differs from it in that its hilt is similar to the Type Fii, with short quillons hooking out and curving forward. Some have multiple, low-profile ribs, which help strengthen the blade but do not hinder a deep cut. Not many have been found but they are distributed all over the Aegean, suggesting widespread use. A typical length is 400–600cm.

Type H is rarer. It is similar to the Type G except that the

quillons are less hooked. The hilt does not end in a T but has a rod-like extension upon which the pommel was fastened. The design may have originated further east, rather than in the Aegean; examples have been found in Anatolia, Rhodes, and Syria. Length varies from 350 to 500mm.

The final type is the Naue Type II. This is considered to be a revolutionary design. It is sometimes called a 'grip-tongue sword' ('Griffzungenschwert'). This weapon first seems to have been developed in northern Italy and the Balkans in the thirteenth century, but was soon adopted in many regions from the British Isles through to the Aegean and Mediterranean and into the Middle East. It is split into subgroups depending on the shape of the hilt: Group A has a fishtail end, Group B has a flat tab on the end, and Group C has a projecting pommel tab. Most blades are similar in shape to the Type F but longer, typically 580–680mm, though Cretan examples are often much shorter (500–560mm) and northern examples can be much longer (over 700mm). Most have parallel edges but some examples have edges that swell slightly towards the tip, giving a leaf-shaped appearance. The blade has no need of a reinforcing midrib but some variants still have a small one, which was probably a carry-over from earlier traditions. The sword is well-balanced, being equally capable of cutting and thrusting, and its solid construction means that it could withstand heavy use in battle. The introduction of the Naue II coincides with the replacement of full-height shields with smaller, more manoeuvrable shields, suggesting that a different style of fighting was being practised during this time. (For more detail, see 'The Transitional Period' outlined in the Introduction, p. 10.) The Naue II saw use in various forms for up to seven centuries in both bronze and iron.

It is difficult to say that Bronze Age swords 'evolved' over time, since this implies that later swords are 'better' than earlier swords. Swords are designed for specific types of fighting so it is possible to say that one sword is better than another for a specific task, but the other design might be preferred for a different purpose. The Type A and Type B, for example, are better for thrusting at a distance, but not so good for swinging cuts. The Type I cleaver is very good at heavy, chopping attacks, but is not very manoeuvrable. The Naue Type II seems to be a decent general purpose sword, but it can't thrust as well as a Type A nor can it chop as well

as a Type I.

Wielding a Bronze Age Sword

As noted above, Bronze Age swords are designed to be used in conjunction with a shield. Molloy's experiments suggest that combat with these swords would have involved draw-cuts targeting muscles and tendons, and thrusts to softer parts of the body. Analysis of edge damage on extant Middle Bronze Age examples revealed few indications of repeated edge to edge contact with other swords.²⁸ Damage is more consistent with contact against shield edges. Defensive techniques would therefore have involved interposing the shield and glancing sword parries, rather than solid blocks. Molloy observes²⁹ that blows with Middle Bronze Age swords

come from the elbow and shoulder, with the wrist controlling finer movement, especially slicing cuts. The strength and reach of the blade were not sufficient for strikes involving the whole upper body and/or waist. Draw cuts would be the intended form of edge-attack; these are executed by slicing the blade along the target either on delivery or more likely on recovery of a stroke (i.e. pulling as opposed to pushing the blade along the flesh). This would allow the blade to "bite" and cut without excessively shocking the structure through force of impact.

It has been noted that the swords of the Late Bronze Age, such as the Naue Type II, were not 'better', just 'different', and so were wielded differently. Molloy notes that the tang and hilt are more solid than earlier blades. The structural integrity is more secure, leading to heavier blades (typically 400–650g, but some weigh over 1kg) and a change in balance and harmonics. It even changed the way the warrior held the sword. Molloy writes:³⁰

The grip used when handling these Late Bronze Age swords can either be four fingers on the handle, or else the index finger can be wrapped around the ricasso, aligning the trajectory of the blade's edge with the natural trajectory of the arm. The U-shaped depression in the hilt plates at the shoulders created a comfortable place to locate the thumb, as it fits into the curvature here and enhances control of the sword. When using this weapon, primary control and power comes from the shoulder, with the elbow slightly bent and generally "leading" the blow with the point of the elbow moving on roughly the same trajectory as the blade edge. This allows the blade to be deployed in quite rapid tight-arc'd cuts, comfortably cutting as many as three times in two seconds with a sword of over 800g weight.

It was discovered that the heavier variants of these swords could cut almost as well as the Type I cleaver, slicing through flesh and scoring the bone of the pig carcass. It has been speculated by some that the curved, leaf-shaped edges of these blades were intended to increase weight and allow an attack more like an axe. This is unlikely, since the distal taper is at its thinnest here. The curve allows the blade to bite more deeply during a draw-cut, just like a sabre.

Spears

The spear appears in virtually every culture that ever engaged in mass combat. It is cheap to produce, relatively easy to use, and very effective in formation fighting. Spears are split into two main categories: thrusting and throwing. Here the term 'spear' is used to refer to thrusting varieties and 'javelin' refers to throwing spears. In practice, these two categories are not much use because it is usually impossible to tell whether the majority of spearheads were intended for javelins or thrusting spears. Generally, javelins are lighter and have a smaller head than thrusting spears but there is a

lot of overlap. The earliest spearheads had tangs which fitted into a slit in the end of the shaft, where they were secured with lashing. There have been many finds of spears dating to the Early Bronze Age including Birecik, Carchemish, Kara Hassan, and Hassek Höyük. They are similar in shape with slender, leaf-shaped blades and straight, square-sectioned tangs. A lot of spears also have solid butts on the other end of the shaft. They range in profile from circular to polygonal. Some have a spike on the butt and this is common on spears in the Late Bronze Age. Spear butts act as a counterweight, moving the centre of balance back and permitting the wielder to hold a greater length of the spear in front of him, which gives him more reach when thrusting.

Illustrations suggest that thrusting spears could vary from 2.5 to 4m in length until the Late Bronze Age when the weapon shortens to around 1.8-2.5m. This coincides with the shift from two-handed spears to one-handed variants.

Along with the nine swords and daggers found at Arslantepe (dating from the end of the fourth millennium), twelve butted spears were also found. All are made of an arsenic-copper alloy. The spears contain 2.5-3 per cent arsenic and the swords contain 4.5-5 per cent. They are similar in shape to the above-mentioned spearheads except that the head is longer and the butt is longer relative to the blade.³¹ Many early spearheads are very similar in shape to early daggers. They have a short tang, a wide, triangular profile, and a reinforcing midrib.

By the second millennium most spearheads are long and narrow and the socket has largely replaced the tang, though tanged spearheads continue to turn up after this period. There isn't much point in trying to group spearheads into specific dates since they appear in various cultures throughout the Bronze Age. Unlike swords, there are few differences in the design of spearheads after the second millennium, but there is an evolution in the methods of fixing them to the shaft. The first method involved the tang, which fitted into a slot in the end of the shaft. This had several disadvantages: the main one is the shaft's propensity to split upon impact; another is that the tang is liable to snap if lateral stress is placed on the blade. The next method is the forged socket, which first becomes evident around 2200 BC. It is made by making a spearhead with a long, wide tang and forging the ends around a rod into a tubular socket. This

socket went over the shaft, which was whittled to fit. The final method is to cast the socket and head in a single piece rather than forging the socket. This form of socket first appears in Central Europe but had spread to the Aegean and Middle East by the fourteenth century BC. Javelins are more likely to have tangs and spears usually have sockets.

A few attempts have been made to formally categorize spearheads. Aegean typologies were attempted by scholars such as Snodgrass and Höckmann.³² All systems are fairly subjective and sometimes it is difficult to classify a particular weapon because it might have characteristics of more than one typology, or the differences between some types are so small as to be inconsequential. Nevertheless, it gives a ready list to describe the different spearhead shapes and sorts them into predefined groups. Here is one suggested grouping system for Aegean spearheads.

Type A spearheads mainly date between c. 2200 and 1600 BC. They have an elongated shape that gradually widens towards the tang and could belong to either javelins or thrusting spears. The tang is usually short and flat but can be long and thin. Length varies between 150 and 380mm. Some have holes through which lashing can be threaded.

Type B is distinguished by having what is sometimes referred to as a 'shoe socket', which consists of two half-socket protuberances on either side. The end of the shaft was tapered so that it slotted into this socket. Some had a pointed metal tab that bit into the shaft and prevented it from pulling back out of the socket. These heads are small and slender, around 110–190mm long, and they are more likely to belong to javelins. They date to the same period as Type A.

Type C has a long slender tube-socket. They are generally dated later, from c. 1600 to 1200 BC. These spearheads are still fairly slender but they can be very long, from 140 to 600mm, and many have the classical 'willow-leaf' shape. Most blades are about the same length as the socket. The larger ones clearly belong to thrusting spears. Some have a reinforcing midrib.

Type D has many things in common with Type C. Both have a similar tubular socket except that Type D's is shorter in length. Some have holes in them so that they can accept a fastening pin. They have a similar shape to Type C but are shorter in length, from 190 to 510mm (but most are 230–

270mm).

Type E has a socket and a long slender blade. They have a prominent midrib which appears 'pinched' on many examples and the tip isn't pointed like most spearheads. Length varies from 160 to 320mm.

Type F has a slender blade which flares out before the narrow neck of the socket, which is less than half the length of the blade. Most have one or more reinforcing midribs. Typical length is 170–450mm.

Type G is similar to Type F except that the flare before the neck of the socket is more pronounced and the socket itself is shorter. The blade is more kite-shaped. There is great variety in the shape of spearheads in this group and there is justification for separating it further into subgroups. Typical length is 120–450mm but there is no point in trying to pin down a typical date for this group since they appear in many regions and time periods. These lightweight spears would have been equally capable of throwing as well as thrusting.

Type H is shaped more like a spike. It is difficult to tell where the blade ends and the socket begins. The two sharp edges are not much wider than the reinforcing midrib. Many have holes in the socket for a fastening pin. Length can vary from 125 to 570mm. Four examples were found at Dendra along with the famous panoply (see p. 75), suggesting that this type of spearhead was designed to help counter metal body armour.

Type I has a short, oval leaf shape varying from 150 to 210mm in length. The socket is usually cast, not forged, and it is about half the length of the blade or even shorter. It has two holes for a fastening pin. It was widely distributed throughout the Aegean and Europe and saw continued use into the Iron Age.

Type K has a short, tapered shape measuring from 100 to 210mm. The short socket is usually cast, not forged, with two holes for a fastening pin. They are similar to Type G but have shorter sockets. It is possible that some of the smaller examples with narrow sockets are actually arrowheads.

Type L is similar to the spike-shaped Type H or even Type D, but the edges can bulge out a little in the centre. Length can vary from 195 to 320mm and the socket can be forged or cast.

Type M has shoulders that sweep out before tapering back into the socket. The shape is described as 'lanceolate'.

Type N has barbs that protrude back at an angle from the blade. Presumably the barbs are to prevent the point from easily being removed, which is a trait that is more desirable on arrowheads rather than spearheads, since having a spear that is difficult to remove from the target is counterproductive. As they are very small, with nothing over 100mm in length, it is likely that many Type N spearheads are actually arrowheads.

Many of the above designs saw use long after the Bronze Age, the only distinction being that they were made of iron, not copper-alloy. There is no evolution as such; each is designed for a specific purpose. Wide blades don't penetrate deeply but leave a larger wound channel, causing more bleeding. Narrow spearheads penetrate more deeply and can be easier to remove. Spiked spearheads can punch through light armour. Lighter spearheads are useful on javelins because they increase range.

Iron

It is commonly believed that the Hittites were the first to start using iron weapons but this is in no way certain. Iron weapons appeared in several cultures at around the same time. The most famous is the iron dagger found in Tutankhamen's tomb. The Amarna letters show that the Mitannians had also started using iron weapons. Letter 22 has King Tushrutta giving an iron mace, an iron dagger, and ten iron-tipped javelins to Egypt as part of a large shipment of gifts. Only one sword was found at Nuzi and it was made of copper-alloy but the grip inserts were made of iron and iron rivets were used to attach them (see p. 48). A recent find of an iron fragment from Kaman-Kalehöyük in Turkey may push the earliest instance of iron-working back to the start of the second millennium.

Many think that the change from bronze to iron was a result of this metal being superior to bronze for making weapons. Recent reconstructions, including the author's own impromptu experiments, have shown that this is untrue. Properly cast and work hardened bronze blades perform just as well or better than early iron blades. It isn't until the

intricacies of quench-hardened and tempered steel are understood that iron swords start improving in performance. At the end of the Bronze Age, the main advantage of iron was its availability. Copper and, more importantly, tin, were scarce resources, often having to be imported long distances. Iron was far more abundant. With the development of iron weapons and armour, many more troops could be well-armed. The Assyrians were the first to be able to protect a large number of their troops with metal armour, giving a great advantage in battle. Many iron scales were found at Nineveh, as described by Layard:³³

These scales were from two to three inches in length, rounded at one end, and square at the other, with a raised or embossed line in the centre, and had probably been fastened to a vest of linen or felt.

These scales are very similar to many earlier scales made of bronze (see 'Armour', p. 70).

Cultural Variations

The basic weapons of various cultures are largely the same. All used swords, spears, maces, bows, axes, and so on, which are outlined above. But each culture had its own varieties and methods of use. The following gives more specific information and peculiarities regarding the weapons used by various Bronze Age soldiers.

Sumerian Weapons

By the time of the Early Dynastic period (2550–2400 BC) the axe had largely replaced the mace as the primary battlefield weapon. The Cemetery of Ur has revealed the greatest number of weapons dating to this time period. In the common graves were found 58 spearheads, 171 daggers, and 309 socket axes.³⁴ Hamblin suggests that the relative numbers of the various weapons can be used as an indication of the various troop-types of Sumerian armies during this

time.³⁵ In other words, the majority of troops carried daggers and axes, while a smaller proportion carried spears. Throwing sticks are mentioned in texts (*illuru*, *ñešbu*) and are depicted in illustrations.

Egyptian Weapons

The earliest evidence for maces in Egypt is on a vase found at Abydos (tomb U-239) and dated to the first half of the fourth millennium. These maces appear to be piriform in shape (*hd*) and would have been made of stone. Another Egyptian mace in use at the same time was the 'disc' mace (*mnw*). It is illustrated at Karnak in the hands of rulers striking down enemies. It has a sophisticated design: the top is ground into a concave depression and the lower half is shaped into a shallow hour-glass. Some say that it is a stylistic representation of the lotus flower. As a weapon, it is fairly fragile, with the thin edge susceptible to damage, but its advantage is that it can concentrate the impact into a small area. Old Kingdom texts describe three different maces: *dsr*, *mhn*, and *izr*, but it isn't possible to tell which types these terms are denoting.

Old Kingdom axes are known as *mibt* and Middle Kingdom axes are *minb*, but the two terms are unlikely to be describing different types of axe. Early cutting axes are narrower than later ones. The later ones are typically the 'epsilon' axe and the 'eye' axe, but piercing axes are also used. Depictions from Beni Hasan suggest that the axe was by far the most common weapon. Near the end of the Middle Kingdom a new type of weapon appears. It is a combination axe-mace (*h3*); the head has a curved axe blade on one side and a mace or hammer on the other. In the Middle Ages, this kind of weapon was called a 'poll-axe'. Amenemhet III (1843–1797 BC) is depicted using it in a smiting scene.

The Beni Hasan murals also show the sling being used on the battlefield. Slingers are lined up behind the archers, perhaps implying that the sling had a greater range than Egyptian bows of this time.

Spears carried by infantry troops are called *hnty* in Middle Kingdom texts and javelins are *nywy*. By this time spears are shorter, between 1.25 and 1.5m in length, but the heads are still tanged, fitting into a slot in the shaft, and lashed to

secure them. Some had metallic butts to adjust the balance. Socketed spearheads don't appear until the New Kingdom.

The khopesh has been mentioned above (p. 33). Egyptian examples tend to be a little shorter than Near Eastern ones. In Egyptian iconography the khopesh seems to replace the mace as the symbol of authority: rulers are seen smiting their foes with this weapon rather than the mace that was depicted in earlier illustrations.

Egyptian bows were made from local timber. Old Kingdom texts mention two types: *iwnt* and *pdt*, but it is unclear how they differed, since all Old and Middle Kingdom bows are self bows. Caroline Cartwright and John Taylor report that, of the fifteen Egyptian self bows in the collections of the British Museum, seven were made of acacia wood (*Acacia sp.*), six were of sidder (*Ziziphus spina-christi*), and two of tamarisk (*Tamarix sp.*).³⁶ One of the tamarisk examples, the earliest one in the collection, dating to the Neolithic period, is incomplete, making it difficult to positively identify as a bow. It was found in a grain silo so it is possible that it is a threshing stick.

Bow strings were made of four-strand twisted gut. On self bows, it was wrapped around the ends of the bow ten or twelve times and secured by hitches. On composite bows, the string slipped over a grooved nock with a simple eye splice. McLeod writes that 'the twisted gut was unlaidd, its strands were looped around and passed through the unlaidd portion, and knotted about the cord.'³⁷

Egyptian arrows were made of reed and tipped with hardwood feet and some sort of point. Some arrows dating to the third millennium were found in a leather quiver at Saqqara. They were less than 500mm in length, suggesting that the bows of the time were short and had little power.

Middle Kingdom arrowheads were made of stone (flint and agate), bone, ebony, ivory, and, near the end of the period, bronze. Many were fletched with three feathers. Ted Hart examined some arrows dating to the Middle Kingdom and found that the shafts were made of common reed (*Phragmites communis*). The total length including the hardwood feet and flint heads averaged 840-885mm.³⁸

Four hundred and thirty New Kingdom arrows were found in Tutankhamen's tomb. Henry Blyth has summarized the results of their examination, saying that they were 'very light

(usually about 0.35–0.5oz., 10–15g) rather long (usually between 30 and 33 in., 0.76–0.84m), and made of a slender reed giving a large deflection (outside diameter usually 9/32–5/16 in., 7–8mm).³⁹

Mitannian/Arraphian Weapons

The Nuzi texts call swords *patru*.⁴⁰ Like most swords of this time, they had a double-edged triangular blade usually made from work-hardened copper-alloy. One passage lists eleven small swords (*patrati sehruti*) and two large swords (*patru rabutu*) (HSS XIV 529:8f.).⁴¹ They also indicate that swords had varying weights: one is noted as weighing fifty shekels of bronze (SMN 2703) and two others weigh forty shekels of gold (SMN 2658). One actual example was found in the Hurrian levels at Nuzi; it was made of copper alloy, about 380mm long (blade length, 260mm), with the grip made of iron insets and fastened with an iron rivet.

Arraphian axes were called *hassinu* and by this time they were being used as tools as well as weapons, since it is mentioned that an axe was used to chop wood (HSS V 47:3). Various texts list axes among other metal objects such as containers and jewellery, not just weapons. One axe head is listed as weighing five shekels (HSS V 86:1) and another weighs one mina (HSS XV 158:1f.), equivalent to fifty shekels. No actual examples were found at Nuzi, but one found at Hazor might have been similar in shape. It was fairly narrow and thin, designed to punch through armour and skulls.

The Nuzi texts say that Arraphian arrows were called *qanu* though they occasionally use *hurhututu*, which was perhaps a Hurrian word. The arrow shaft is called *illu*.⁴² Arrowheads did not have a name, but were denoted by the logogram *(gi).kak.(u).tag.ga*. There seem to have been different types of arrows; one was called *šukudu* and another was *šule*, but it is unclear how they differed. A quiver is called *ispatu*. These were made of leather and often elaborately decorated.⁴³

During the excavations at Nuzi, copper-alloy arrowheads were found throughout the private houses and in one of the temples. Sizes and shapes varied considerably. Arrows were fashioned by craftsmen called *sasinnu* ('bowmakers') who fletched the *qanu* shafts with feathers, and fitted copper-alloy

arrowheads. Each family seems to have had a full quiver of forty arrows stored at the house, and these were restocked by the city armoury when required. Timothy Kendall has noted that large numbers of arrows were distributed to other towns. One batch of 1,000 arrows was given to a representative of the town of Sauawa; 2,000 arrows were allocated to the city of Hurasuna; and 10,000 arrows were taken to Dur-ubla. One man called Unaptešup took 2,300 arrows from the palace stores on one occasion, 5,000 arrows on another, and 20,000 on a third.⁴⁴ These numbers imply that Nuzi was not only a major manufacturing centre for arrows, but that the city stocked vast numbers in its arsenals.

Arraphian bows were called *qaštu* and it is likely that they were triangular in profile judging by Egyptian illustrations of them. It is uncertain whether they used composite or self bows.

Even though a handful of spearheads were found at Nuzi there are no confirmed mentions of the weapon in the texts, though a few ambiguous terms might have been used to refer to spears.

Canaanite Weapons

Canaanite weapons were probably similar to the Mitannian ones described above. Illustrations of Canaanites show bows, javelins, slings, throwing sticks, swords, khopeshes, and axes, both cutting and piercing types.

Hittite Weapons

In the Middle Bronze Age, the Hittites are depicted with the same weapons as their neighbours. Infantrymen carry maces, axes, spears, and javelins. Charioteers have bows and axes. At Troy, stone hand axes start to appear right from the beginning at Level I (first half of the third millennium). One example was made of jade. In the second level (last half of the third millennium) there were found some exquisite axes made from jade and lapis lazuli, and the first copper-alloy axes. It is likely that any copper-alloy implements this early would have been used for warfare. They are narrow 'piercing axes' between 150 and 300mm in length; the heaviest weighs 1365g.

The double-bitted axe appears in Hittite iconography and it is possible that this were used in battle.

Most Hittite swords and spears are similar to those found in the Aegean and can be fitted into the typology systems summarized above, though there are local variations involving less pronounced midribs or even multiple ribs.

Mycenaean Weapons

Mycenaean swords and spears have been discussed at length in the relevant sections above (pp. 36–41 and pp. 42–45), since the Aegean typology system was the one being used. Swords began as long slender weapons with a solid midrib (Type A) and by the end of the Bronze Age, the Naue Type II was the most popular sword. Spearheads are largely the same the world over. The distinction is how they were used. The spear is the primary weapon on the battlefield, while the Mycenaean sword is depicted mostly as a weapon for despatching fallen foes, though it may have been more prominent in single combat. Early Mycenaeans used long, two-handed spears and a full-height shield slung over the neck. By the end of the Bronze Age, spears were one-handed varieties designed to be used with smaller, mainly circular, shields.

Maces have been found in the Aegean just like everywhere else. Some are regular spherical or piriform maces while others are more unusual. One found at Aghia Triada looks like a mallet and another from the same site looks like a double-bitted axe except that the edges are not sharp but flat faces. In the *Iliad*, Areithoos is said to have wielded a ‘great bar clubbed of iron’ (7.138).

Plenty of axes have been found dating back to the late Neolithic. Mycenaean axes are similar to those used by the Egyptians; they include epsilon axes, crescent axes, and piercing axes. Copper-alloy piercing axes start to turn up in the last half of the third millennium. A buried hoard of over a hundred copper-alloy axes, hammers and tools was found off the coast of northern Greece, near the village of Glyfada, Mesi, dating to c. 2500 BC.⁴⁵ All axes at this time have flat backs designed to be wedged into the end of a haft. Socket axes appear early in the second millennium. Some piercing axes have a secondary smaller axe bit or even a spike on the

back.

In Crete, some rare double-bitted axes were found dating to the middle of the second millennium. They look more like a wood-cutting axe than a battle axe, but it is difficult to be certain. Similar axes were found at Mycenae dating to the same period. Many Cretan axes have inscriptions suggesting that they were votive offerings and not functional tools. Other double-bitted axes (*labrys*) clearly have a ceremonial function since they are miniatures made of gold. The crescent shape definitely has strong symbolical significance. There is no way to tell whether the double-bitted axe was ever specifically designed for combat, but this seems unlikely in Crete, where it was associated with females rather than males. Equally, there are illustrations depicting its use in the sacrifice of animals, but none depict its use in battle.

There is only one illustration of a sling and that is on the silver 'Siege Rhyton', which is dated to the middle of the second millennium. None have survived in the archaeological record but sling shot has been found in the Aegean since the Neolithic period. Most are of shaped limestone or baked clay and are biconical in form, but they were being cast from copper-alloy and lead by the end of the Bronze Age. Homer says that the Lokrians had slings made of 'strong-twisted wool' (*Iliad* 13.717).

It is very clear that the Mycenaean made extensive use of the bow both in hunting and warfare. Most arrowheads were tear-drop, sub-triangular, or 'concave butt' in shape, regardless of whether they were made of flint, obsidian, or copper-alloy. The Linear B tablets found at Knossos list arrows in significant numbers: one lot consists of 6,010 arrows and another lot of 2,630 arrows, enough for 216 archers to receive forty arrows each. At the same site were found stockpiles of bronze arrowheads. The tablets also mention bow makers (*to-ko-so-wo-ko*). It should be noted that there is little evidence of archery in the Early and Middle Helladic periods. No metal arrowheads appear until the Late Helladic period, when they start to appear in abundance and continue to be found at sites dating through to the end of the Bronze Age.

Chapter 3

Chariots

As the definition of a chariot, Mary Littauer and Joost Crouwel decided upon 'a light, fast, two-wheeled, usually horse-drawn, vehicle with spoked wheels; used for warfare, hunting, racing and ceremonial purposes. Its crew usually stood'.¹ The word 'chariot' comes from the Latin *carrus*, which seems to have a Gallic origin. The word *car* originally referred to a war chariot, and it was further differentiated by the number of horses that pulled it: a two-horse chariot was called a *biga*; a three-horse chariot was a *triga*; and a chariot drawn by four horses abreast was a *quadriga*. During the Bronze Age most chariots were pulled by two horses.

The first vehicles were various forms of sledge such as the travois, a simple construction consisting of two poles joined at one end to form a V. The load was tied in place on top of the poles and the frame was dragged along the ground with the sharp end of the V at the front. It wasn't until the invention of the wheel and axle that these sledges could be lifted off the ground. It is impossible to tell which culture first invented the wheel since the earliest evidence appears at around the same time (mid-4th millennium BC) in Mesopotamia, the Northern Caucasus and Central Europe.

The earliest wheels were simple discs with a hole for the axle. Spoked wheels were developed later and enabled lighter, faster vehicles. It is unclear whether the chariot evolved from earlier four-wheeled wagons such as those pulled by onagers in Sumerian illustrations (e.g. the Standard of Ur, c. 2500 BC) or whether it was developed separately. The earliest evidence of spoked-wheeled chariots dates to c. 2000 BC and comes from sites of the Sintashta-Petrovka and Andronovo cultures on the steppes of Russia and Kazakhstan, in which sacrificed horses and the remains of chariots in various stages of completion have been found. Evidence for horses being sufficiently domesticated for riding

during this time has also been found in this region. The Sintashta-Petrovka culture seems to be the ancestor of the Indo-Iranian cultures that spread across the steppes and into Iran, Pakistan and parts of India during the following few centuries. It is likely that the first chariots came from here and gradually spread out to regions as disparate as China and Celtic Europe.

According to Arthur Cotterell, the development of the war chariot required three elements: spoked wheels, trained horses, and composite bows.² The chariot combined mobility with fire power. Spoked wheels and light construction combined with a wide wheel-base and rear-mounted axle all contributed to improved speed and manoeuvrability. Standing directly over the axle gave a more stable platform from which to shoot and took some of the load from the horse. Fire power included the ability to wield a heavy warbow, which had previously only been possible while standing on the ground, and the capacity to carry back-up weapons including swords, spears, javelins, and extra arrows. Tom Hulit and Thom Richardson found that the shorter composite bow was easier to manage from within a chariot while a longer self bow would have been more awkward.³ The chariot suffers from the same drawback as all wheeled vehicles: it requires fairly smooth, flat terrain in order to travel at any great speed. It is likely that the earliest roads were constructed to facilitate the movement of chariots.

Most chariots are constructed in a similar manner and have many components in common. They consist of a platform on which the charioteer stands; if it has sides then it is called a 'cab' and is usually open at the back. There is a hand-rail of some sort to help the charioteer keep his balance. The cab sits on an axle, and the two spoked wheels turn independently of the axle. A draught-pole joins the cab to the team of horses. The yoke fastens the draught-pole to the horses, which the charioteer controls by means of reins and harness. The various types of chariot and their construction will be discussed in more detail below.

Horse Riding

The common argument that Bronze Age horses were too small to ride has been refuted by many authors since the

1970s. A good overview was written by T.G.E. Powell in 1971.⁴ The type of horse that was available for chariot warfare has been palaeontologically demonstrated to have been perfectly capable of carrying riders, since it was the size of a large pony. Egyptian reliefs show that messengers and scouts sometimes rode horses during military campaigns. The Battle of Kadesh reliefs depict four lightly clad Egyptian horsemen armed with quivers and bows, three of whom are specifically called 'scouts' (*hpytw*). Homer refers to Patroklos as a 'rider of horses' (*Iliad* 16.126) and Diomedes' squire, Sthenelos, rides one of the horses he stole from the Trojans while leading the rest of the herd back to camp.

Even if the inability of a Bronze Age horse to carry a rider is discounted, there were other reasons why the chariot was preferred to horse riding in combat, including the increased carrying capacity (a chariot could carry two or more men along with all of their equipment), the ability of a warrior to devote all of his energies to combat instead of controlling the horse, and prestige, because the chariot was clearly a status symbol while horse riding, more importantly, was not. In a letter from Bahdi-Lim to Zimri-Lim, King of the city of Mari (c. 1775–1761BC), the ruler was advised to preserve his dignity by riding in a chariot, or even on an ass, but never on horseback when in the presence of Akkadians.⁵ It is obvious that there was some sort of stigma associated with horse riding.

Chariot Warfare

In many Bronze Age societies the chariot industry was controlled by the state. It is likely that chariots were multi-functional, since it is unreasonable to assume that a state's entire store of chariots was sitting idly in an armoury waiting for the next military engagement. But it is clear that there were several different types of chariots: some were more elaborately decorated than others, and some were lighter and more manoeuvrable than others.

Most scholars agree that many of the great military powers used the chariot primarily as an archer platform. The earliest association of bows and chariots comes from the Mari texts of the Middle Bronze Age (18th century). These texts indicate that both chariots and bows were being issued to soldiers at

the time. The Egyptian accounts of the battles at Megiddo and Kadesh support this dominance of the battlefield by the chariot archer. In Egypt, according to Alan Schulman, the smallest tactical group consisted of ten chariots. Five of these groups, or fifty chariots, formed a squadron.⁶ The accounts of both Megiddo and Kadesh make it abundantly clear that the chariot was the primary offensive unit whilst the infantry played a defensive role. It is even more noteworthy when one considers the numbers involved. Egyptian texts say that at Kadesh the Hittite king, Muwatallis, had two large divisions of infantry, one before and one behind him. Breasted translated the two numbers as 8,000 and 9,000, but Sir Alan Gardiner revised them to 18,000 and 19,000. In any case, the relevant fact is that a very large portion of the army never took a direct role in the fighting. The infantry stayed with Muwatallis to guard the city of Kadesh.

Sanskrit chroniclers reveal that the Aryan invaders of India were also chariot archers. The *Mahabharata* depicts its heroic charioteers dashing about the battlefield shooting arrows into the enemy infantry, and slaughtering them in great numbers. When two heroes meet, there is usually a phase in which the chariots circle around one another while arrows are exchanged. Only when a chariot is disabled do the heroes dismount and fight with hand weapons. The Chinese classical text *T'ai Kung's Six Secret Teachings* demonstrates how important the chariot was in warfare during the 'Warring States' period.⁷ According to Bruce Brooks, the basic Chinese fighting unit was a two-man chariot with a driver and archer, supported by up to ten footmen.⁸ It is likely that the Chinese chariot archer dominated the battlefield as early as the Shang period; Chinese chariot burials are known from around 1250 BC. Cyrene, too, used chariots primarily for bowmen. Xenophon (*Cyropaedia* 6.27) compared Cyrenaean chariot-use with the Asians, implying that the bow was the principal weapon.

Chariot archers were typically deployed in long shallow formations spaced out perhaps twenty or thirty metres apart; each charioteer would need enough room to manoeuvre if a comrade were disabled in front of him. On occasion, a chariot force might be stretched out into a single line to prevent outflanking by the enemy. Robert Drews notes that if this was done at Megiddo then the Egyptian line, which consisted of

over a thousand chariots, would have been almost two miles long.⁹ As the opposing forces closed, the archers would shoot arrows over their horses' heads towards the enemy, perhaps beginning at a range of around 200m. Early salvos would have been long-range volleys, with archers picking out individual targets as the range shortened. Rate of fire would also be increased as the distance narrowed. It is difficult to determine what happened when the two opposing forces came together. One possibility is that they somehow merged together, slipping between the lines and milling around, engaging the enemy in close-range target-shooting. Another is that they continued in a straight line, opening their ranks enough to allow archers to shoot at each other as they passed by. A third option is that they wheeled off before contact was made and continued to shoot whilst withdrawing for another pass. A fourth option is that the force split in two, one to each side, in the hope of outflanking the enemy. Considering the fairly low numbers of casualties, it is reasonable to conclude that one of the latter two tactics was the most common. If one side were severely outnumbered, it is likely that they would have split off and retreated before the distance was closed. The primary goal seems to have been to incapacitate the enemy's chariots; killing the charioteers themselves seems to have only been a secondary consideration. When one of the forces had suffered enough attrition, they would withdraw to the protective line of infantry, rather than forming up for another charge.

It was commonly believed that the Hittites were different and crewed their chariots with spear-wielders rather than archers. The theory is based on the fact that Egyptian illustrations usually show Hittite charioteers with spears rather than bows. The proposed tactic of the Hittite chariot resembles that of the medieval knight, using a long lance to knock an enemy charioteer out of his vehicle or to kill his horses. It has also been argued that the Mycenaeans were chariot-lancers. Peter Greenhalgh claims that the Boghaz-Keui records suggest that 'the Achaean prince had visited Hattusas, the *haute école* of chariotry, to receive instruction in that art'.¹⁰ So if the Hittites were chariot-lancers then Greenhalgh concluded that the Mycenaeans must have been too, since the Greeks supposedly learnt the art of chariot warfare from the Hittites. He uses Mycenaean Stele V from Grave Circle A (fig. 5) as evidence since he claims that it could show a charioteer running down a fleeing enemy with a

long lance. However, close examination of the image shows no lance at all. If it were a lance, it would not be gripped right at the back end of the shaft and the point would not finish in line with the horse's head. The so-called spear shaft looks more like simple reins running from the driver to the horse. The figure in front may be a fleeing enemy, but he may also be an allied chariot runner. Relying on iconographical evidence alone to draw conclusions is poor scholarship.

In his PhD dissertation, Richard Beal convincingly demonstrates that the Hittites were, in fact, chariot archers, just like their neighbours. The bow was the primary weapon of the Hittite chariot warrior, not the lance.¹¹ If it is true that the Mycenaeans had a close relationship with the Hittites, who were chariot archers, then it seems that the Mycenaeans may have been chariot archers also, and not lancers as Greenhalgh claims.

Robert Drews has argued strongly against the concept of chariot-lancers:¹²

Here, again we may be categorical: the notion that either Hittite or Mycenaean chariot warriors could have relied on the lance as their primary offensive weapon is for practical reasons out of the question.

Roger Moorey is in agreement, saying that there is no evidence for light chariotry ever being used to charge infantry.¹³ Drews acknowledges that charioteers would have carried spears and other *mêlée* weapons, but they were intended as back-up weapons, and were not the primary method of attack. He goes on to cite from Littauer and Crouwel who have demonstrated through practical experimentation the impossibility of thrusting over the heads of one's own team of horses or from the back of a moving chariot. They have also demonstrated the impracticalities of thrusting to the side when passing another moving chariot.¹⁴

There are a handful of Mycenaean illustrations that show chariot warriors with spears, but none of them suggests that the weapon might have been used to charge an enemy using the 'shock tactics' proposed by Greenhalgh. It is likely that the spear was used, as Drews suggests, as a back-up weapon

to counter infantry or to despatch fallen charioteers. Linear B evidence suggests that Mycenaean palace states, such as Pylos and Knossos, could field several hundred chariots.¹⁵ The tablets also list arrows in significant quantities: 6,010 arrows are recorded in one lot and 2,630 in another.¹⁶ Large numbers of bronze arrowheads were found by Sir Arthur Evans at Knossos and it is likely that they were intended for distribution to Mycenaean warriors. One must conclude that both archery and chariots played a major role in Mycenaean warfare during this time.

If every other major culture in the region used their chariots as archery platforms then it is reasonable to conclude that the Mycenaeans did likewise. There is some iconographical evidence of Mycenaean chariot archers, but all of it seems to involve hunting, not warfare. Even if there is no conclusive proof that the Mycenaeans used chariot archers on the battlefield, the preponderance of evidence suggests that it is likely. However, a problem arises because Homer specifies that the Achaeans used chariots to attack with lances. In Book 4 of the *Iliad*, Nestor advises his charioteers that, upon reaching the Trojan chariots, they should thrust their spears, rather than throwing them (*Iliad* 4.350–356), implying a tactic similar to that used by heavy cavalry lancers. Patroklos later attacks and kills many men whilst riding them down in his chariot (16.218–428). In Book 5, Ares attempts to lunge over the ‘yoke and the reins of his horses with his bronze spear’ (5.851–2). Automedon also attempts this tactic, but is unsuccessful because his driver has been killed, so he ‘had no way while he was alone in a separate chariot to lunge with the spear and still keep in hand his fast running horses’ (17.464–465). It is difficult to reconcile these descriptions from the *Iliad* with the arguments against Mycenaean chariot-lancers. Keep in mind that Homer’s epic describes a battle that probably occurred after the dominance of the chariot archer, so the reader should not expect Homer’s heroes to be shooting arrows from the back of a chariot (see ‘The Transitional Period’ outlined in the Introduction, p. 10).

To summarise, it seems likely that, at least in the same time period as the battles of Megiddo and Kadesh (i.e. 15th–13th centuries), Mycenaean aristocrats were primarily chariot archers. This does not, however, indicate that they were still so inclined by the time of Homer’s Trojan War,

though, given the above arguments, it is difficult to believe that the warriors in this conflict were chariot-lancers as implied on a few occasions by Homer.

Egyptian Chariots

Whenever Bronze Age chariot warfare is mentioned, the first people that come to mind are the Egyptians. The Egyptian accounts of the battles of Megiddo and Kadesh bring this type of warfare to life. The Egyptian word for chariot is *wrrt*, and seems to be a native Egyptian word, rather than derived from the Semitic language of the Hyksos. The Semitic word, *mrkbt*, does not appear in Egyptian texts until centuries later. Evidence for Egyptian chariots can be found in illustrations, texts, and physical remains (including six examples from the tomb of Tutankhamen).

Littauer and Crouwel described the construction of the chariots in Tutankhamen's tomb in enough detail to enable accurate reconstructions to be attempted.¹⁷ We know that they were very light; Cotterell reckons that an Egyptian chariot weighed less than 30kg.¹⁸ The assembly was held together with rawhide binding and glue. Each carried two men, standing side-by-side, and was pulled by two horses. By the time of Tuthmosis IV, Egyptian chariots had developed into a unique design, which is generally considered to be superior to those of her neighbours. Before this time the wheels had four spokes, but afterwards they had six. Yadin notes that the depiction of the number of spokes on various monuments is meticulous and widespread enough to use this feature to help date the monument. If the illustration shows four-spoked chariot wheels, then it must date before c. 1400 BC, and if it shows six-spoked wheels, it must have been done after this date.¹⁹

It is likely that Egypt exported large numbers of chariots, despite not having much in the way of local timbers from which to construct them. Cotterell outlined the types of timber used, none of which were native to Egypt. The chassis, yoke, wheel hub, and felloe were made from elm which was imported from Ugarit. The draught-pole was made of willow, and the wheel spokes of plum. Birch bark was used to cover the assembly.²⁰ The axle was usually made of ash and sometimes sheathed in metal to reduce wear. Animal grease was used for lubrication.

Each chariot had a wide, semi-circular cab with an open back. The front and sides were sometimes covered in several layers of leather, which wouldn't be as protective as the scaled chariots of the Mitannians (p. 60), but would offer some protection. The platform was about one metre deep and made of woven rawhide strips. The axle was placed at the back of the cab and the riders stood directly over this to take some of the load off the horse and to improve manoeuvrability. Each wheel measured 1m in diameter and consisted of a circular felloe, or rim, and a wooden tyre. The tyre, consisting of four segments which could be individually replaced as they wore down, was attached to the felloe with rawhide strips or bronze wire laced through holes in the side. Each wheel had six spokes (or four, in earlier designs), elliptical in section and tapered towards the ends, which were tenoned. Some later illustrations show wheels with eight spokes, but there are no surviving examples. An 'ultra light' version of the Egyptian chariot has survived and is currently in the Florence Museum. It dates to the 15th century and consists of little more than a narrow platform above the axle and a rail for the charioteer to hold. The wheels have four spokes, not the usual six.

The horses' bodies were covered with trappers but it is difficult to tell from illustrations which ones were armoured and which were simply decorated cloth. The top speed of the chariot is limited by the speed of the horses and the smoothness of the terrain. Accurate reconstructions of Egyptian chariots have been safely towed behind modern automobiles on modern roads at speeds of up to 50km/h.

Even the earliest Egyptian chariots are depicted with an attached bow case and arrow quiver, facing diagonally forward with the opening near to the archer's right hand. One papyrus notes that a chariot leaving for Retennu was equipped with eighty arrows (probably enough for two full quivers).²¹ A javelin quiver was added by the time of Rameses II (1279-1213 BC), which coincides with the transitional period proposed earlier in this book (p. 10), where chariot archers were being superseded by javelineers.

Hittite Chariots

Hittite records mention chariot warfare even earlier than the Egyptians. The Old Hittite Anitta text dates to the 18th

century BC, and notes that there were forty teams of horses at the siege of Salatiwara. There are no physical remains of Hittite chariots and most of the pictorial evidence comes from the Kadesh reliefs at Abydos, so Egyptian bias must be taken into account. Like Egyptian chariots, Hittite chariots are depicted with the axles located at the rear of the platform, not the centre, and they have six-spoked wheels. The frames were probably made of heat-bent wood and covered with a fabric of cloth or hide. Based on the limited evidence available, it seems that two-man Hittite chariots were of a very similar construction to Egyptian chariots. The driver was called *kartappu* and doubled as a shield bearer. The warrior was called *šuš* and his primary weapon was the bow.

The Hittites also introduced a heavier chariot to handle the additional weight of a third passenger. These examples have the axle located at the centre of the platform, which was probably rectangular rather than D-shaped. The draught-pole seems to disappear under the platform and probably continued to the back to give increased support. As argued above (pp. 55–56) it is unlikely that the Hittites could have used their chariots for charging with a long lance, so the three-man crew consisted of a driver, shield bearer, and archer. Egyptian records describe them standing in a row, ‘three men to a span, acting in unison’ (Breasted, III.312).

Mitannian Chariots

The Arraphian word for chariot is *narkabtu*. Many chariots were owned by both private individuals and the state. State-owned chariots were stored in arsenals called *bit nakkamti* and could be requisitioned for many different purposes including war, festivals, caravan escorts, correspondence delivery, and so on. Kendall notes that there were a variety of chariots in the Nuzi tablets.²² The most elaborate one, decorated in precious metals (HSS XV 17:26f.), was known as *iškaru*; it was mainly used for ceremonies and loaned to visiting officials. Another elaborate chariot was called *mazzahushu* but there isn’t enough detail to know how it differed from *iškaru*. A third type was called *narkabtu sa seri*, which literally translates as ‘chariot of the campaign’, so it is fairly certain that it is a military vehicle. The fastest chariot, illustrated on at least two Nuzi seal impressions, was called

narkabtu qallu or ‘light chariot’, and appears very similar to the Egyptian version in the Florence Museum (see ‘Egyptian Chariots’, above). The wheels of this very light chariot had four spokes like the Egyptian example and were called either *rubu’itu* (HSS XV 55:4) or *tumnatu* (HSS XV 87:2).

The Nuzi texts indicate that many different craftsmen worked to construct a chariot for the Arraphian military machine. Bronze chariot fittings were made by *napphau* (‘smiths’); *askapu* (‘leatherworkers’) made horse harnesses and the leather parts of the chariot; *nangaru* (‘carpenters’) made the wooden parts of the chariot, including the wheels, and assembled them into the final vehicle; finally, an official with the title of *eruhlu* inspected the finished product and then certified them ready for sale to private individuals or the state. According to the Nuzi tablets, chariots were built in two stages. First, the carpenters shaped the timbers and assembled the vehicle, and then the leatherworkers finished it with leather fittings.

The wheels were called *magarru* and were made of *sakkulli* or *halmadru* wood. Most had six spokes (*šešatu*). Other types of wheels are called *wašuhru* (HSS XV 167:15f.) and *putwe* (HSS XV 95:1,7,9), but it is unclear how they differed from one another. Seal impressions from Nuzi show chariot wheels with four, six, and eight spokes.²³

The cab of the chariot is called *bītu* (‘house’) and made of *isu* wood. The platform was called *nakbasu* (‘floor’, from *kabasu*, ‘to step upon’). There also seems to have been a gate called *babu* which was closed behind the charioteers. The yoke was called *niru* or *simittu* (perhaps different types of yoke), and it was padded with wool. The chariot-pole was called *mašandu*. When the leatherworkers received the unfinished chariot from the carpenters, it would have been an open frame. One of their tasks was to cover the frame of the body and the platform with a fabric of leather or wool called *puraku*. Reins (*ašatu*) were also fashioned from wool. If the chariot was a military vehicle then the body was covered with scale armour similar to body armour and given the same name (*sariam*). They were outfitted with one or two bows and one or two quivers of thirty or forty arrows. Egyptian reliefs also depict enemy chariots protected by scales.²⁴

Assyrian Chariots

The Bronze Age Assyrians never wielded great power until the reign of Tukulti-Ninurta (1243–1207 BC). He defeated both the Hittites and Babylonians in great chariot battles and even looted Babylon itself, carrying off much wealth. During this period, Assyrian chariots were similar to Egyptian and Hittite models. They used the same word for ‘chariot’ as the Akkadians (*narkdbtu*).

Like all other chariot powers during the Bronze Age, the Assyrians were chariot archers. It was only later that their vehicles became heavier and more suited to shock tactics, carrying up to four men. The wheels became much larger too; eight spokes made them more robust, and larger horses were bred to pull heavier loads. These large-wheeled chariots were called *uttartu*. By this time, however, infantry played a far greater role on the battlefield than chariots (see ‘The Transitional Period’ outlined in the Introduction, p. 10).

Mycenaean Chariots

The study of Greek chariots began with Johann Ginzrot’s technological treatise early in the 19th century,²⁵ and was continued by scholars such as Walter Leaf and Wolfgang Helbig in the 1880s, and Oskar Nuoffer and Eugen von Mercklin in the early years of the 20th century; more recently, Mary Littauer and Joost Crouwel have further refined our knowledge of the subject. The story begins in the Minoan period but it is difficult to tell which evidence is Minoan and which is Mycenaean, since there is much overlap between the two cultures. Here there will be no attempt to differentiate between the two. There are no physical remains of Mycenaean chariots so we must rely on iconographical evidence and the physical remains from other cultures to try and piece together a coherent picture.

In Linear B, the chariot is called *wokha*. The earliest illustrations suggest that it was first used in the Aegean in the 16th century BC. These are referred to as ‘box chariots’ based on their depiction in several crude illustrations on gravestones and seals. If these are interpreted literally then it seems that the earliest Greek chariots were no more than platforms surrounded at knee height, but lacking a hand rail or any other means of keeping one’s balance. If we are to

believe this interpretation, then the driver and his passenger were perched precariously while being pulled at speed by multiple horses. Clearly this interpretation is nonsense and it should be obvious that real chariots were never constructed like this. The carvings in question are stylized simplifications of actual chariots.

Another type of chariot, where the platform is D-shaped with a curved, waist-high hand rail, is called the 'quadrant chariot'. However, it is more likely that the box chariot and the quadrant chariot are the same vehicle. The difference lies in the level of detail and accuracy of the various illustrations.

A later chariot, dating to the 14th-15th centuries, has been classified as a 'dual chariot'. It is similar to earlier chariots except that it has semi-circular 'wings' attached to the back of the cab. These wings, which would have assisted mounting the chariot and may have acted as a kind of 'mudguard' against stones and other debris thrown up by the wheels, are not evident on the chariots of other cultures. The cab was covered with a cloth or leather fabric and often decorated in various shades of red or purple; coloured cabs could have been a means of distinguishing different squadrons. This cab was attached to the horse team by means of an upper and a lower draught-pole, which joined at the yoke, reinforced with a vertical brace. This brace was L-shaped and connected to the draught-pole near the front of the cab, forming an 'A-pole', where the yoke is attached to the apex. A triangular pattern on several illustrations suggests that some chariots had additional bracing lashed to the two draught-poles for further reinforcement.

Cotterell writes that the Mycenaean chariot was a 'solidly walled box' with carved wings made from a heat-bent rail reinforced with a crossbeam. The front and the wings of some seem to be covered with spotted ox hide. The two-man crew apparently stood on a floor made from interwoven leather thongs or basketry.²⁶ All of these point to the Mycenaean chariot being a little heavier than those of her neighbours, but it is likely that it was still light enough for one person to lift. Nevertheless, a light variant known as the 'rail chariot' was developed. It dates to c. 1300-1150 BC and can be distinguished by its open frame, with little more than a platform and a hand rail. Illustrations are too simplistic to determine any more detail but it is likely that this open framework increased speed and manoeuvrability, while

denying the charioteer much support or protection. As noted above, both the Egyptians and the Mitannians had similar vehicles.

Since all Mycenaean illustrations depict the chariot with four spokes, it is fairly certain that this was so, but we should keep in mind that simplistic illustrations need to be studied with care and cannot always be interpreted literally. For example, there are plenty of Chinese rock drawings showing stylized chariots with four spokes, but it is easily demonstrated from other evidence that, in reality, they had up to thirty spokes. Without a surviving example of a Mycenaean chariot, there will be many unanswered questions.

Warry relies extensively on Homer to describe Mycenaean weapons and tactics, including his reconstruction of their war-chariot.²⁷ It is certainly possible to use the *Iliad* to reconstruct Homeric chariots, but there is no way to know how close Homer's descriptions are to the ones that were actually used. Axles are oaken (*Iliad* 5.838), and chariots are pulled by a brace of horses (5.195), usually two (5.272, 6.38), but occasionally more (11.698, 15.680, 16.467-70). Homer's chariots were light enough for one man to carry, for Diomedes debates whether he should draw the chariot of Rhesus out of the way, or carry it on his shoulders to safety (10.503-5). Some of Homer's chariots were richly decorated in precious metals (10.322-3, 10.438). Homer describes his chariots as 'curved' (5.231, 6.39), with some sort of hand rail (5.262, 5.322, 11.535-6), most likely at waist height to help support the standing charioteer. This fits the depiction of chariots in the above-mentioned iconographical evidence. There are examples of charioteers being killed by foot soldiers with swords, sometimes wounded in the head (5.584, 11.109). This, combined with the ease with which warriors mount their chariots and jump to the ground while fully armoured, suggests that they were low to the ground. Chariots were used on level ground (12.119) and rough terrain disabled them (6.38-9). Homeric chariots are most often used as the 'heroes' taxis' described by Finley,²⁸ where the warrior dismounts and fights on foot, keeping his chariot in the rear for a quick retreat (5.321-2, 13.535-9, 14.430-2, 16.657), though there are incidents where foes are attacked directly from the chariot with spears or swords.

Linear B evidence suggests that Knossos alone could field

200 chariots or even more. Chadwick, however, is not convinced that the real 'field strength' of the Knossos chariotry is as strong as the Linear B tablets suggest, claiming that the geography of Greece is not conducive to using war chariots in any great numbers.²⁹ The Linear B chariots could represent the overseas aspirations of the Mycenaeans, or they may have been used on Greek soil. There is little doubt that the chariot was an elite method of transportation both in civilian and military life. As discussed above, Homer reveals that they were often decorated in precious metals and Mycenaean paintings show women being transported in them. The extensive road network in Greece during the Mycenaean period also supports the widespread use of the chariot.³⁰ From all this, it would seem that the chariot was the preferred method of aristocratic transportation, but it does not indicate how prevalent they were in Greek battles.

The lack of the right sort of evidence makes it very difficult to determine how Mycenaean chariots were used in battle. In order to determine whether large numbers of chariots were used in combat on Greek soil, one needs to discover where these battles took place. It is probable that the organized formality of Greek battles enabled both sides to agree on a battlefield favourable to chariot tactics, perhaps even staging these battles in a neighbour's territory, such as Boeotia or Thessaly, where the terrain was more appropriate. Epameinondas described Boeotia as 'the dancing floor of war' (Plutarch, *Moralia* 193E). The formality of later hoplite battles suggests that encounters were planned and agreed upon by both sides beforehand, rather than being impromptu skirmishes whenever two enemies came upon each other. Victor Hanson supports this, writing that 'Greek hoplite battles were struggles between small landowners who by mutual consent sought to limit warfare (and hence killing) to a single, brief, nightmarish occasion'.³¹ Just like the chariot, the phalanx is not suited to fighting in rough terrain. Aristotle writes that the phalanx must break formation when crossing 'even the narrowest ditch' (*Politics* 1304). Polybius writes, 'it is acknowledged that the phalanx requires level and clear ground with no obstacles such as ditches, clefts, clumps of trees, ridges and water courses, all of which are sufficient to impede and break up such a formation' (*Histories* XVIII.31-32). Phalanx warfare could, therefore, only be organized on a more or less flat, clear plain, yet it

was the preferred Greek formation for centuries.

It is entirely possible that the same fields that were used repeatedly for hoplite battles were also the sites of earlier Mycenaean chariot battles. If both sides used chariots, then it would benefit neither to fight in terrain unsuitable for this vehicle. An uneven battlefield would prevent the nobles from engaging in their preferred method of combat and force them to fight on foot alongside the 'rabble', an undignified situation that would prevent the gaining of *kleos* so desired by Homer's heroes. The *Iliad* can be used to support the argument that large-scale chariot battles took place in Greece. Nestor tells of a battle during his youth in the Peloponnese between the Epeians and the Pylians (*Iliad* 11.669-760). Even this relatively small skirmish seems to have involved at least a hundred chariots, for Nestor boasts that he personally defeated fifty enemy chariots (11.747).

When the above is combined with the evidence presented in Chapter 1, it seems reasonable to imagine lines of chariot warriors on the battlefields of Greece, and to interpret them as chariot archers, at least during the Early Mycenaean period when chariot archers dominated the battlefields further east. These battles appear to have consisted of a series of charges and retreats with a continuous exchange of arrows, as credibly reconstructed by Drews.³² (See Chapter 1 for more detail.) Nevertheless, although the chariot warriors' primary means of fighting was with the bow, they are often depicted carrying spears and occasionally swords, too, in case of hand-to-hand skirmishing.

Chapter 4

Armour

Introduction

For armour to be useful it must offer a practical balance between protection, mobility, and fashion. Generally, the more protection armour provides, the heavier it is and the less mobility it allows. So long as a particular type of armour provides a good degree of protection against the most common threats on a battlefield, it will continue to be used. Whenever a threat develops to the point that a type of armour is no longer a reasonable defence, it will either be augmented till it once again provides adequate protection or it will be discarded.

The most common threat on any Bronze Age battlefield was from spears and arrows. One must conclude that all the types of armour worn during this time must have provided good defence against these weapons. This does not mean that armour rendered the wearer invulnerable, but it is reasonable to assume that a warrior considered himself likely to survive a battle if he was properly armoured. The protective capacity of armour will be discussed in more depth later (p. 84). The main purpose of armour for most of the Bronze Age seems to have been as a replacement for a large shield, freeing up both hands for other tasks, such as wielding a bow or a two-handed spear, or driving a chariot, while still enabling the warrior to resist the enemy's weapons.

A Note on Terminology

Before discussing various typologies of armour, the meaning of various terms needs to be clarified. Sometimes the same

word has been used to describe different types of armour over various time periods, and sometimes terms have a different meaning in popular literature from their meaning in scholarly works.

Firstly, the erroneous use of the term 'mail' needs to be addressed. The word is derived through the French *maille* and Italian *maglia*, from the Latin *macula*. The most accurate translation of *macula* in this context would be 'mesh', such as that created by a net. Regarding armour, the term 'mail' is reserved for a flexible defence created by an interlinked mesh of metallic rings (so-called 'chain mail'). Any armour not made in this fashion should not be called mail.

However, this definition of mail was not the one used by Victorian scholars. They used the word in a more general sense, in order to describe any sort of metallic body armour, so that 'mail' comes to mean 'armour'. In translations of early texts, it is common to see the word 'mail' in passages where it is clear that the subjects cannot have been wearing mail. One well-known example is the biblical description of Goliath wearing a coat of mail weighing 5,000 shekels of bronze (1 Samuel 17:5-6). The use of the word 'mail' in this instance was not meant to specify armour of interlinked rings, but was used as a general term to indicate armour; in this case, bronze scale armour. Many authors today continue to use this term erroneously; even archaeological publications sometimes use 'mail' to describe scale or lamellar armour.

Other examples of the misuse of this word include using 'plate mail' for plate armour, and 'scale mail' for scale armour. Because of this overly-generic use of the term 'mail', Victorian scholars needed to differentiate a mesh of interlinked rings from other types of body armour: hence, the term 'chain mail'. If the word 'mail' is used in its correct context, then 'chain mail' is superfluous and does not need to be used at all. It should be noted that mail armour did not exist during the Bronze Age. Current evidence suggests that it was first developed by the Celts in central Europe in the 3rd-4th centuries BC and was soon adopted by the Romans.

Another common confusion involves scale armour and lamellar. Scale armour consists of small plates, either metallic (iron or copper alloy) or organic (leather, rawhide, horn, wood, bone, etc.), cut to a regular size and attached to a foundation of textile or leather, such that each scale overlaps some or all of its neighbours. Often the scales are

‘imbricated’, meaning that each horizontal row is staggered from the rows directly above and below it, to resemble fish or reptile scales; but some scale armour is made with the plates aligned both horizontally and vertically. The direction of overlap of each row is also irrelevant. Most often, scale overlaps downwards, but some examples overlap upwards.

Lamellar, on the other hand, consists of similarly-sized plates laced or wired to each other, such that there is no need for a foundation. The lacing itself provides structural integrity. Lamellar is often less flexible than scale armour, but it provides better protection, especially against points (e.g. arrows and javelins). There is very little evidence to suggest that lamellar was ever utilized in the Bronze Age, and evidence for this type of armour dates much later. Using these definitions, any Bronze Age armour that has been described as ‘lamellar’ in earlier publications is, in fact, scale armour.

Two armour terms that are often used interchangeably are ‘cuirass’ and ‘corselet’. To avoid confusion, this book will use the term ‘cuirass’ to describe torso armour made of a rigid material, such as metal plate or hardened leather. The term ‘corselet’ will be reserved for torso armour made of a flexible or semirigid construction, such as scale or textile.

Pictorial Evidence

It is irrational to try and use historical iconographical evidence the way that we would use photographs. Artists need to simplify illustrations and carvings to make the scene ‘easier to read’, so stereotypes are used for ethnic groups, and specific styles and symbols are adopted to convey various ideas. All of this distorts the reality of the scene’s content. In virtually all cases it is possible to give more than one interpretation to any given aspect of a scene. Armour is particularly susceptible to this since it can be difficult to render accurately, even when using modern techniques. One example is the obverse of the ‘Warrior Vase’ from Mycenae, where the soldiers are said to be wearing segmented bronze or leather armour. This interpretation is easily discredited by simply looking at the reverse of the vase, where the same pattern is used in a manner that cannot possibly be interpreted as any kind of armour.

In the vast majority of cases, it is impossible to use graphical evidence to determine whether an item was made from a particular material. Even if detailed colour is used, who can tell from an illustration whether a particular item is dyed cloth, painted leather, or enamelled metal? All three have been found in the archaeological record. Furthermore, a pigment will often change in colour as it ages, so it is difficult to determine its original colour. The best approach is to look at written texts and extant archaeological finds and try to reconcile these with the pictorial evidence.

In the case of scale armour, it is fairly certain that this type was worn during the Bronze Age because of the amount of physical and textual evidence that has been discovered. It is fairly easy to distinguish a representation of scale armour from other typologies, but it is still impossible to tell the material from which it was made. A painting in the tomb of Rameses III shows a corselet decorated in alternating rows of red, blue, green, and yellow scales, which are usually interpreted as bronze (yellow) and painted leather (red, blue, green). However, it is possible that all the scales are made from dyed or painted leather, or that all the scales are made from enamelled bronze. The Nuzi texts describe scale armour being made from a combination of bronze and leather,¹ so it is feasible for the original interpretation to be correct; but it is just one of several possibilities. Depictions of leather, in particular, are easy to confuse with metal since both can be shaped and decorated in similar fashions. Many early interpretations of leather armour have turned out to be metal upon further study.

Sometimes a decoration might correspond to a known type of weaving pattern giving a strong indication that it is textile. Tassels are another indicator of textiles since a long fringe is usually an artefact of the weaving process, where the warp threads are left long enough to tie into tassels. However, Herodotus wrote about Libyan women wearing leather dresses with tassels of leather thongs (*Histories* 4.189.1). Yet even if textiles are identified, how does one tell whether a particular garment was intended to be used as armour or whether it is just a piece of clothing? The same applies to leather, for there are plenty of examples of leather being used to make clothing. The context can sometimes be useful: if a person is illustrated in battle then the chance of him being depicted in armour is higher than if he were illustrated

in a civilian setting. But even in battle, many soldiers never wore body armour. Most were lucky just to have a helmet. In many cases, the subject's status can be an indicator; the higher the social status, the greater the likelihood of wearing body armour.

It can be seen that pictorial evidence is only of limited use when trying to determine the types of armour that a culture may have used, so one must rely upon descriptions of armour in various documents along with any physical remains recovered from archaeological sites. Without at least two of the three types of evidence available, all we have is speculation, which is often unfounded.

Textiles

Linen is a fibre that is extracted from the flax plant. In Linear B, the word for flax is *linari*. In classical Greek, anything made from flax is called *linos*, from which our word 'linen' is derived. Linen has a fairly high tensile strength and is better than most fibres for making armour. It is surprising how much protection a few layers of quilted linen can provide. For example, compared to hardened leather of similar weight, quilted linen defences actually provide better protection. This will be discussed in more detail later (see 'Defensive Capability of Bronze Age Armour', p. 84).

Some Mycenaean frescos depict what might be white linen body armour. However, as noted above (see 'Pictorial Evidence'), without supporting evidence, this is pure speculation. Fortunately, we have such evidence. In the *Iliad*, three of Homer's characters, Adrestos, Amphios, and the lesser Aias, are described wearing linen armour (*linothorex*).

ἀλλὰ πολὺ μείων· ὀλίγος μὲν ἦεν
λινοθώρηξ (2.529)

... but far slighter. He [Aias] was a small
man wearing linen armour.

τῶν ἧρχ' Ἀδρηστός τε καὶ Ἀμφίος
λινοθώρηξ (2.830)

these were led by Adrestos and Amphios
wearing linen armour

There are also some physical remains of what is likely to be linen armour. Two large fragments of layered linen were found in a Mycenaean grave near Patras and dated to c. 1100 BC. They consist of 10–15 layers of linen, and part of an embroidered edge with a spiral pattern is evident. Heinrich Schliemann found a smaller fragment, apparently with 14 layers, during his excavations of sixteenth-century tombs at Mycenae.²

It has been speculated that some types of linen armour were glued together, but there is not a shred of evidence to support this. All surviving examples of layered linen armour, regardless of the culture or time period, are quilted, not glued. Sometimes they are covered with a fine layer of leather, but this was more probably intended to protect the garment rather than to improve its defensive capacity.

The Egyptians are also likely to have utilized textile defences. One of the chambers in the Tomb of Rameses III (Structure KV11, chamber Ch) has a wall painting of a garment that could to be textile armour since it is accompanied by other weapons and armour. In his *Histories*, Herodotus attributes linen armour to the Egyptians, Samians, Assyrians, Phoenicians, and Syrians (1.135; 2.182; 3.47). Other authors also mention linen armour, though not during the Bronze Age. Xenophon mentions linen armour twice (*Anabasis* 4.7.16; 7.63); Plutarch says that linen armour was taken as booty at the battle of Issus (*Life of Alexander* 32); and Pausanias writes that linen armour could be susceptible to iron weapons and so was better for hunting (*Description of Greece* 1.21.7).

Felt

Felting is one of the oldest methods of making woollen textiles. The Sumerians believed that the secret of felt-making was discovered by Urnamman of Lagash. For felt, the fleece does not need to be spun into thread first; the fibres are matted, condensed, and pressed into a fabric. Water and friction are used to cause the 'scales' on wool to bind with neighbouring fibres. Thick felt is a particularly useful material for making armour because it is very resistant to weapon points; unlike cloth, there is no woven structure for a point to slide through. Felt was usually used as the innermost layer of armour, since it acted as padding while providing an

additional layer of protection. It was a common material for helmet liners, for example.

Leather

Often when texts mention 'leather' armour, they are confusing this material with rawhide. However, with many archaeological finds, the degree of decomposition makes it very difficult to tell whether the item was originally made of leather or rawhide. Tanned leather makes a fairly poor material for armour unless it is further processed to harden it, which actually makes it function more like rawhide. It is extremely likely that most leather armour was made of rawhide, or at least semi-tanned leather; most of the effort in tanning leather is the softening process, and softness is not a desirable trait in armour.

This book will not attempt to distinguish between the two materials. Whenever 'leather' is mentioned, it can usually be taken to mean any hide derivative, whether it is tanned leather, hardened leather, cured hide, or rawhide. The only evidence for leather body armour during the Bronze Age is in the form of scale armour. The Nuzi tablets list types of leather scale armour (see 'Mitannian/Arraphian Armour', p. 72) and a leather scale corselet was found in the tomb of Tutankhamen (see 'Egyptian Armour', pp. 73-74).

Bronze

Pound for pound, metal provides by far the best protection when compared to other available materials. To give armour made from another material the same protective capacity, it will have to be thicker, and consequently will weigh much more than an equivalent item made of metal. The predominant metal during the Bronze Age is, not surprisingly, bronze, an alloy of copper and tin. The higher the proportion of tin, the harder the resultant alloy. Typical bronze armour would have a tin content of about 8-10 per cent. It looks different from modern alloys, which use phosphorus and silicon as additional alloying elements, and has different mechanical properties. Historical bronze has a beautiful golden colour compared to the brown/green hues of modern bronzes.

Scale

Because archers need two hands to operate their bows, they cannot carry a large shield, and therefore need to rely on armour for protection. Scale is by far the earliest and most widespread type of metallic body armour. The initial concept may have been inspired by observing scaled animals such as fish or reptiles. For example, the Arraphian word for these scales is derived from an earlier Akkadian word meaning 'snake' (see 'Mitannian/Arraphian Armour', p. 72). As previously noted, scale armour is made of small, thin plates of metal or organic material, laced together in horizontal rows and then attached to a foundation of textile or leather. Scales may be staggered ('imbricated') from one row to the next to increase the armour's strength, but some examples have scales aligned both horizontally and vertically.

Metallic scales dating to the Bronze Age have been found across Europe, through the Aegean, and into the Middle East and Asia. H. Russell Robinson claimed that this type of armour was probably invented in the Middle East. The earliest Egyptian representation of scale armour is in the tomb of Kenamon, who lived during the reign of Amenhotep II,³ but Timothy Kendall believes that this type of armour was first introduced into the Near East by the Hurrians during the early 16th century.⁴ It is at this time that bronze scale first appears in Hurrian lands; many scales were found at Nuzi. The Nuzi tablets also indicate that leather was used to make scale armour at this time. There was a corselet made of leather or rawhide scales found by Howard Carter in the tomb of Tutankhamen (1333-1324 BC). Hamblin believes that the scarcity and hence the cost of metal in the Early and Middle Bronze periods made metal body armour unavailable, so the use of copper alloys to make scale armour is unlikely to be much earlier than this.⁵

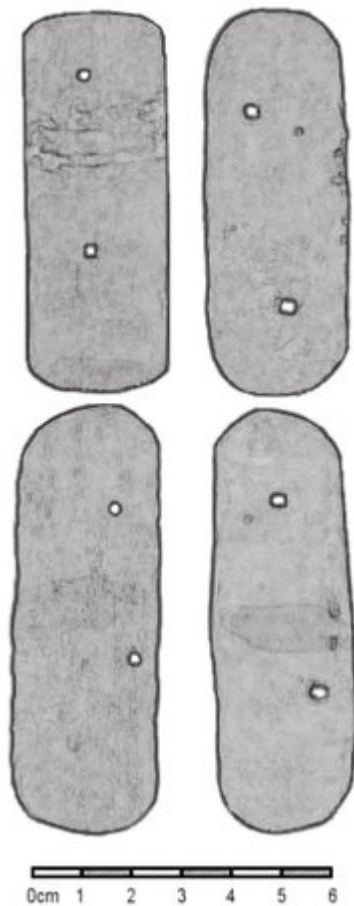


Figure 6. *Four copper scales found at Asyut, Egypt, dated to the 11th or 12th Dynasty (c. 1800–2000 BC).*

However, the Petrie Museum in University College, London, has four copper scales (No. UC38049A) that were found at Asyut in Egypt, and allegedly date to the 11th or 12th Dynasty (c. 1800–2000 BC) (fig. 6). It is possible that this dating is wrong or that the plates are not from scale armour. The size and shape are correct but there are only two holes, whereas most scales have at least four holes to enable them to be laced both to each other and to a cloth or leather backing. It is difficult to envision a lacing pattern that would enable two-holed scales to be assembled into armour. However, if the early date is correct, then the plates could indicate a type of proto-scale armour; for example, the plates

might be individually laced to the backing but not to each other. If this were true, then we could reverse the direction of influence, and conclude that the Egyptians invented scale armour and that it was only later adopted by the Hurrians.

Bezanting

This is a term given to armour made from circular, coin-sized discs sewn onto a foundation of leather or textiles. In Europe it was sometimes called a 'pennyplate coat'. It differs from scale in that the plates do not overlap. The vast majority of examples of bezanting have turned out to be misinterpretations of illustrations (see 'Sumerian Armour', below) or the physical remains have ended up being some sort of decoration. It should only be classed as armour if its primary purpose is defensive. Bezanted armour needs the discs to completely cover the garment in order to provide reliable protection.

There are a few tantalizing possibilities for this kind of armour. Hector Catling reckons that the 60 bronze discs found in Grave Shaft IV at Mycenae were from bezanted leather armour but, given the number and varied size of them (19–42mm) it is more likely that they came from a helmet, if they weren't just decoration for something. Robert Dyson found what he interpreted as a leather gauntlet reinforced with bronze 'buttons' in the Mannaeen citadel at Hasanlu in Iran and dated to the early Iron Age.⁶ Other bronze discs were found elsewhere on the site and he thinks they may have come from other examples of bezanted armour. Earlier layers have not been well excavated so we don't know whether these discs are also located in strata relevant to Bronze Age occupation. Some Mycenaean helmet illustrations may also show depictions of bezanting (see 'Helmets', p. 80). One should be wary of interpreting any illustration as bezanted amour. The depictions are usually so simplistic that it is impossible to determine what the circles could be representing. One can interpret them in any manner that fits a preconceived theory.

Sumerian Armour

There is very little evidence to draw upon to determine the

body armour worn this early in the Bronze Age. As stated above, metal scale armour does not appear for another millennium and non-metallic body armour is purely speculative. The Standard of Ur shows the lower ranks in long spotted cloaks. Some have opined that these cloaks were made of leather and reinforced with copper discs,⁷ but there is nothing to support this. From an iconographical point of view, the illustrated cloaks look more like the hide of an animal with spotted fur. From an archaeological point of view, the cemetery of Ur contained many copper-alloy weapons and a few copper-alloy helmets, but not a single metallic disc. From a practical point of view, adding a sprinkling of copper discs to a garment does little to improve its protective capacity. It increases cost and weight with negligible benefit.

Mitannian/Arraphian Armour

The most comprehensive evidence for Bronze Age scale armour comes from the Mitannian palace at Nuzi, located on a tell (mound) called Yorgha Tepe, near modern Kirkuk in northern Iraq. The palace and private houses found on this site date to around the fifteenth century BC. Texts recovered from this site during excavations in the 1920s reveal that this armour was called a *sariam*, but the term could also be used to describe the complete panoply of the warrior, including his weapons, his horses, and even his chariot.⁸

This armour consisted of a knee-length garment of wool or goatskin upon which were laced overlapping bronze or leather scales, called *kursimetu* (plural). According to Ephraim Speiser, the word *kursimtu* (singular) is derived from an older Akkadian word that means 'snake', probably referring to the similarity between this type of armour and snake skin.⁹ Sometimes the skirt, called a *dutiwa*, is integrated into the torso armour, creating one long garment. Otherwise the skirt is a separate piece of armour secured around the waist. Although the scales found at Nuzi were of many sizes, they can be sorted into two general categories based on size. Large scales covered the body and numbered between 400 and 600, depending on the length of the garment. Small scales covered the arms and the neck, numbering between 150 and 550, depending on whether the sleeves (*ahu*) stopped above the elbow or reached down to

the wrists. Helmets (*gurpisu*) were also covered with scales.¹⁰ (See colour plates for a reconstruction.) Unfortunately there are no illustrations at Nuzi showing how this armour may have looked, but it is likely that most Mesopotamian armour would have been similar in construction and so these illustrations can be used as a guide.

Kendall extrapolated from the weight of the bronze scales and the numbers mentioned in the texts to make seven reconstructions:

HSS XV 9	400 large scales	279 small scales	37.3 lbs.
HSS XV 3:2f.	400 large scales	280 small scales	37.3 lbs.
HSS XV 3:28f.	435 large scales	312 small scales	40.7 lbs.
HSS XV 5:10f.	560 large scales	160 small scales	44.9 lbs.
HSS XV 3:18f.	500 large scales	360 small scales	45.8 lbs.
HSS XV 5:1f.	500 large scales	500 small scales	49.5 lbs.
HSS XV 3:11f.	598 large scales	540 small scales	57.6 lbs.

As can be seen, there are considerable variations, but all are fairly heavy. It is likely that there were no standard sizes and there would have been several styles and lengths. This contradicts the common argument that heavy armour was not being worn in hot climates (see 'Armour and Climate', p. 80). The Nuzi texts also frequently mention hide *sariams* but it is difficult to make an accurate reconstruction because no organic scales were recovered from the site. It is likely that they would have been shaped similarly to the bronze examples and laced in the same manner, but the thickness (and thus the weight) of each scale cannot be determined. Hide armour was far more common than bronze armour. In the booty from Megiddo, for example, Egyptian records indicate that two hundred hide corselets were looted compared with just two bronze ones.

Egyptian Armour

Egyptian scale body armour (*mss*) appears in the annals of the Battle of Megiddo and is illustrated on the tomb walls of Rameses III, Paimosi, and Kenamon. The latter's tomb has a wall painting depicting ribbed bronze scales laced to some sort of foundation garment. It is bordered at the neck, sleeves, and bottom edge with a dyed blue material, possibly

leather. A cylindrical gorget is depicted protecting the neck. Robinson claims that it is leather,¹¹ but some of these gorgets are shown with an embossed rib running around the centre, suggesting that they were made of metal. The only gorget ever found in the archaeological record was with the plate panoply found at Dendra (see 'The Dendra Panoply', pp. 77-80) and this example was made of bronze. It is possible that other gorgets have been unearthed at other locations but have not been correctly identified as pieces of armour.

Scale armour was made of copper-alloy, ox hide, crocodile hide, or even bone. Some scales made from bone were found at Pi Rameses. The most complete example of Bronze Age leather scale armour was found by Carter in the tomb of Tutankhamen. Tom Hulit personally examined this corselet on two separate occasions for his Ph.D. thesis,¹² but bemoans the fact that much of it has been lost and that he had far less to study than the intact corselet recovered by Carter. According to Hulit, the hide scales were sewn to a linen garment. This garment was made of six layers of linen with sixty-four threads per inch and was apparently left in its natural undyed state. The weave of the outer layers was a simple cross-weave pattern, but Hulit was unable to examine the inner layers. However, he found traces of thin, very fine leather forming the innermost layer, which would rest against the body. This appears to be the same leather that was used to line the sleeves. Each scale had an embossed vertical midrib to improve its strength, set slightly off-centre to allow for the horizontal overlap of each scale.

Judging from illustrations, this type of scale design was also used to make Egyptian bronze armour. Lacing could have been done with gut or linen cord. Linen would be fine for rawhide scales but metal scales are better attached with shorter lengths of gut since the edges around the metal holes can cause fibres to fray. They would also need to be held more firmly in place, possibly by double-stitching. The shorter lengths mean that only a small section of scales would need repairing if the lacing broke. The problem with gut is that it deteriorates quickly and would need regular maintenance. One example described by Yadin (a reconstruction is now in the Brooklyn Museum) has a leather backing and his scales are laced in a horizontal overlap, but this is incorrect. The pattern of holes in the original leather foundation suggests a side by side lacing system.

A fragment of bronze scale armour was found with the cartouche of Sheshonk on one of the scales. It looks very similar to the illustrations in the tomb of Rameses III. Each scale is approximately 35mm by 20mm with two holes in each upper corner. Each scale is laced to a leather backing but not to each other. The corselet could reach to the thighs or right down to the shins. Shoulder and arm protection probably consisted of panels that were attached separately.

Mycenaean Armour

The Mycenaeans wore scale armour (*thōrax*) just like all other chariot cultures. One bronze scale was found on the Uluburun shipwreck. It was about 10cm by 2.5cm and embossed with a medial ridge. A second scale was found in the Citadel House at Mycenae. A third one was found at Tiryns, and a fourth on the island of Salamina, which is reputed to have been the palace-state ruled by Homer's Aias (or Ajax). This last example was of a similar size to the others but bore the cartouche of Rameses II, which implies that the wearer of the armour either fought as a mercenary for Rameses II, or that the armour was brought from Egypt as a trade item or war booty. The Uluburun cargo suggests that bronze scale armour might have been a trade commodity. If so, then it also indicates that the Egyptians and Mycenaeans wore similar styles of scale armour. Mycenaeans also began experimenting with plate armour during this early period (see below).

Plate

Many publications discuss the thickness of excavated plates from armour, helmets and such like, but they need to be put into context. The problem with extant armour thicknesses is that these are the minimum that the item ever was. Many bronze items would have seen use by multiple owners and during its decades-long lifetime it would have been polished and maintained. After it is in the ground it then deteriorates, losing even more material, and then it has to be restored after excavation. In virtually all cases the thickness of the item when it was in use was greater than its thickness when it was found and studied.

Most of the evidence for plate armour during this time period comes from the Aegean; bronze cuirasses have been found in central Europe dating as early as 1250 BC, but that region is beyond the scope of this book. A complete suit of plate armour was uncovered at Dendra, dating to c. 1400 BC (see 'The Dendra Panoply', below). Many think that this is the only extant example of Greek plate armour but an additional shoulder pauldron with an appearance very similar to the more famous example was found in a different grave (tomb 8) at Dendra, but dating a century earlier. Two armour fragments were found at Phaistos in the 'Tombe dei Nobili'. The largest was 29.5 × 12cm with holes around the perimeter for attaching a liner or for articulating it with another plate.¹³

Greaves are found on illustrations of both hunting and battle scenes dating as early as the Neo-Palatial Period. A late example was found at Kallithea dating to c. 1180 BC. Another more fragmentary example found at the Athenian Acropolis dates to a similar time period. They are oval discs intended to be fastened to a layered linen backing. The thickest are the Kallithea greaves at around 2 mm. Many are much thinner. Some have rings on the sides to accommodate laces.

Recently some more pieces of plate armour were found in Kadmeia, the citadel of Thebes in Boeotia.¹⁴ This find is dated a little later, c. 1350–1250 BC, and includes fragments of a bronze cuirass; the front and back plates are hinged and joined in a similar manner to the Dendra example, but it is incomplete, missing the shoulders and part of the right side. The Dendra example had folded edges but those on the Thebes example are plain. The cuirass has 2mm holes for attaching a lining and 3–4mm holes for hanging additional plates off the bottom edge. Also found were shoulder pauldrons. They are smaller in size than the Dendra example and are of a similar shape to those depicted on a stone vessel found at Knossos. Like the Dendra examples, the pauldron had 2mm holes for attaching a liner and 3–4mm holes for lacing an additional plate to its bottom edge and for attaching it to the cuirass. The missing shoulder sections on the cuirass are likely to have had the same 3–4mm holes for holding the shoulder armour in place. Also found were two triangular winglets, but, unlike the Dendra example, there are no 3–4mm holes for lacing it to the pauldron leaving its

means of attachment open to speculation, especially since the cuirass is missing the shoulder sections.

Forty-four fragments of curved bronze strips were also found. They have the same 2mm lacing holes and the larger ones also have 3–4mm holes. They appear to be very similar to the Dendra examples except that they are narrower, meaning that more of them would be required to cover the same area. No neck guards have been identified. Since various pieces were found in different locations of the complex, it is unlikely that they all came from the same armour. It is more likely that there are pieces from several cuirasses. It is difficult to speculate on the method of assembly because there are not enough pieces from a single panoply.

In addition to the physical remains, there is also the Linear B evidence, in which symbols have been interpreted as representing plate armour of various typologies.¹⁵ However, the simplified and stylized form of the symbols can be interpreted in many different ways. Supporting Linear B text means that we can be fairly sure that they are meant to represent armour and that this armour was made of bronze. Any further detail is purely speculative and should be treated as such. It is not possible to know whether the symbols represent a Dendra-style armour, or a more segmented typology, or even scale armour. All of the symbols are most likely to represent generic armour and any differences in the graphics can be simply explained by the different handwriting styles of various scribes. Some scribes might put more detail into their ideograms while others would take more shortcuts to simplify the matter. Just because one symbol had three horizontal lines on it and another had four or five does not mean that they are representing different types of armour. It has been shown that Mycenaeans wore scale armour during this time yet there are no ideograms resembling this armour type. (Supposing you had to draw hundreds of tiny representations of scale armour, how long would it take for you to stop drawing the dozens of vertical lines and simplify the subject to a few general hand strokes?) It should be remembered that this is an early form of writing, not a detailed illustration. It is folly to rely upon the sketchy form of Linear B ideograms to make armour reconstructions.

The Linear B text is a little more useful. According to Chadwick, the Knossos tablets (incomplete series Sk) have

words such as *e-po-mi-jo* which has been interpreted as 'shoulder pauldrons'. Also listed are two *qe-ro2*, which is untranslated but could refer to the two halves of a cuirass; the usual word for cuirass, *to-ra-ke* (thōrax) has not been found at Knossos. There is another word, *o-pa-wo-ta*, which literally means 'things hung on' and Chadwick has interpreted this as 'accessories', but 'attachments' or even 'components' might also be a valid interpretation. Chadwick noted that on eleven of the Pylos tablets the number of accessories is specified. Some are listed with twenty large and ten small ones (thirty in total), others are listed with twenty-two large and twelve small (thirty-four in total).¹⁶

These numbers are too small to be describing scale armour and too large to be describing Dendra-style armour. The cuirass and shoulder pauldrons of a Dendra-style armour add up to eight plates. This leaves 22 or 26 plates, too many to be simply a series of segmented panels for the lower torso and thighs; there are only six segments on the Dendra example. The Thebes plates are as small as one-third the width suggesting that up to eighteen plates may have formed the segmented skirt, but this still leaves four or eight unallocated attachments. If the greaves and bracers are included then we have the correct number for the smaller total but four unallocated plates for the higher total.

Some of the Thebes plates described above may form the above-mentioned 'attachments'. Tablets from both Knossos and Pylos describe helmets (*ko-ru*) with four of these pieces along with two cheek guards (*pa-ra-wa-jo*). The means of constructing these helmets probably involved a padded, non-metallic cap over which four curved, triangular segments were attached. It is possible that the same method was used to assemble body armour. A tunic, possibly of quilted linen or fine leather, might have been used as a foundation upon which to attach plates of bronze, similar to scale armour, but using larger plates. This might explain why some of the above-mentioned plates lack the larger 3–4mm lacing holes, for the plates are not laced to one another but to the garment underneath. However, this is an unsatisfactory explanation, since this type of assembly has many practical problems and there is no precedent for this type of non-overlapped construction in any other culture or time period. Nevertheless, it is currently the best explanation based on the fragmentary evidence.

The Dendra Panoply

The plate armour found in a grave shaft (Tomb 12) there has been dated to around 1400BC. Paul Åstrom conducted the excavation and his report was published in 1977.¹⁷ According to Åstrom, the armour consists of fifteen pieces laced together with strips of leather or hide, which are detailed below. Also found were a couple of daggers and a boars-tusk helmet. Two 'blackish' patches have been interpreted as decomposed leather, possibly arrow quivers or shields. There are many myths and misconceptions about the Dendra panoply, such as the supposition that it was too heavy to be worn in battle, that the plates are too thin to protect against weapons, that the armour is too small for an adult to wear, and that it was too heavy to wear in the hot climate of the region. The following is intended to help clarify matters.

Cuirass (thōrāx)

This consists of two torso plates, one for the breast and another for the back. They are hinged at the left side and are fixed closed by means of a loop on the right side and the shoulders. There are square holes on the back plate which fit over the loops on the breastplate. Once in place, leather ties are secured to stop the back plate coming loose. The breastplate covers from the neck down to the navel. The back plate extends down a few inches further.

The extant plates are around 1mm thick or a little less, but three thousand years of corrosion needs to be taken into account plus decades of polishing while it was in use, so it is likely that the armour was a little heavier when newly made. The author's reconstruction has a thickness that varies between 1.0mm and 1.3mm. The edges are folded but this detail is concealed by a leather strip stitched around the edges. The remains of textile lining on the inside of some of the plates are still evident, which would have improved the comfort and fit of the cuirass.

Pauldrons (guala)

Each shoulder guard has two smaller plates: one that attaches to the bottom edge of the shoulder guard, to cover the upper arm, and a triangular 'wing' that laces to the side, to cover the armpit when the wearer raises his arms. The assembly is laced to the shoulder of the cuirass and covers most of the upper arm. These plates are the same thickness as the cuirass, are edged in leather, and lined with textile like the cuirass. Near the top edge of the left pauldron, a small ring has been riveted in place. Its purpose is uncertain, but one possibility is that it helped to hold a weapon belt or quiver strap in place.

Fauld (mitrè)

Six segmented plates hang off the bottom of the cuirass, three in front and three behind. They cover the stomach and thighs. The plates are of the same thickness as the cuirass, edged in leather and lined with textile. Based on the layout of the lacing holes, there are two main ways to assemble the front plates. One holds the plates in position so that they fall almost to the same level as the back plates. The other allows the plates to concertina but the bottom edge sits higher on the thighs, leaving the legs more exposed. The *in situ* position of the plates when originally found, along with the patina pattern on the plates, suggests that the second lacing method was employed and that the front plates could concertina, allowing more freedom of movement. The greater exposure of the legs is less of a concern if the armour was intended to be worn by a charioteer. The open back of the chariot may also explain why the back plates hung down further than the front, since the back of the charioteer would be more exposed to attack.

Gorget (perilaimio)

This turret-like tube goes over the head and sits on the shoulders. It protects the neck and lower part of the face. Similar neck guards are also shown in contemporary illustrations being worn with scale armour. The Dendra example is of the same thickness as the cuirass, edged in leather, and lined with textile. Instead of rivets holding the tube together, there is a neat solder line down the right-hand side. Note that the gorget needs to be donned after the

helmet is on the head, otherwise it prevents the helmet from being tied in place under the chin. It is possible that the neck turret was intended to be worn only by the chariot driver, rather than his passenger (see 'Chariot Warfare', pp. 54-57). If this is true, then it is also possible that the Dendra panoply was intended to be worn by a chariot driver. There are some pottery pieces dating a century or two later showing Mycenaeans wearing what appears to be this neck guard, but they are so fragmentary that it is impossible to tell whether they are infantry or chariotry, and so rudimentary that they could be representing something else.

Greaves (knèmides)

These cover the shins, and are made of much lighter plate than the other pieces of armour. Åstrom describes them as being as 'thin as paper' suggesting that they weren't intended to provide much protection. This makes sense on a charioteer since the chariot would have covered the shins anyway. However, on occasion, the charioteer would have had to dismount and fight on foot. It is possible that the bronze plate only formed the outer facing of a composite defence, perhaps of quilted textiles. Some Mycenaean illustrations suggest that other troops wore greaves made in this manner.

Bracers (perikarpio)

These were intended to be worn on the forearms. Åstrom describes them as being very thin, suggesting that, just like the greaves, they may have formed part of a composite protection made with quilted textiles. This construction would have fitted more snugly to the limbs, so that the bracers were less likely to move about while the warrior fought.

Wearing the Dendra Panoply

Analysis of the skeleton found with the armour, along with measurements taken from the cuirass, suggest that the wearer was about 1.75m tall and weighed about 60-65kg with an athletic physique. The original panoply in the

Nauplion museum is fairly light, being listed as 15-18kg, but it has been in the ground for thousands of years and has undergone a great deal of restoration since then. It is likely that, in its original condition, it was heavier. The author's reconstruction weighs closer to 25kg, but even at this weight it is easy to run, jump, and fight with most contemporary weapons. However, the majority of the weight is born by the shoulders and, without padding; it becomes uncomfortable to wear after a while.

When all of the pieces are worn, very little of the warrior is exposed: the gorget and helmet cover all but a small part of the face; the pauldrons and bracers cover all but the elbow and hands; the fauld and greaves only leave the knees and lower thighs exposed. The shoulder pauldrons limit movement somewhat, interfering with over-arm techniques, such as throwing a javelin or thrusting a spear. Equally, the neck turret limits visibility (the wearer has trouble looking down) and it does not fasten to the cuirass, leaving it free to bounce a little when the wearer moves quickly. It is possible to raise the shoulders and duck the head inside the turret, partially protecting the face from injury. The ability of the front fauld plates to concertina makes it easier to run and to step up into a chariot, but even if laced so that they are less flexible, movement is still not difficult; on the ground, it simply takes practice to work out how to regain one's feet.

Armour and Climate

There is abundant evidence to suggest that heavy metallic armour was worn in the hot, arid climates of the Near and Middle East for at least three thousand years by various cultures. This fact alone should be enough to dispel the myth that heavy armour was too stifling for use in these regions. For more practical evidence, the author has worn heavy armour of various types all day during an Australian summer with no more discomfort than if he had been wearing heavy clothing. The head is the key. So long as the head is kept ventilated and the body hydrated, the outside temperature is largely irrelevant. For example, eyewitness accounts of the Battle of Towton (AD 1461) note that knights in full plate armour, including enclosed helmets, were collapsing from heat exhaustion due to the prolonged mêlée, even though they were fighting in the middle of a snowstorm!

Helmets

Early Dynastic examples of copper helmets excavated from the Royal Cemetery of Ur (2550-2450 BC) had a slightly conical shape that protected the ears and back of the head and neck. Only the so-called Royal Tombs had these helmets. No helmets were found in the common graves. However, the Standard of Ur and the Stele of Vultures show infantry wearing helmets of a similar style. One could infer that the lower ranks wore helmets that were not made of metal. If they were instead made of rawhide or some other perishable material, it might explain their absence. However, the six copper helmets were all found together in only one of the royal tombs, and these helmets were found on the heads of the sacrificial victims placed in the tomb. None of the warriors, whether in the royal graves or the common graves, was found with a helmet. This suggests that copper helmets were not entombed with the deceased, so it is impossible to determine whether the lower ranks wore metallic or organic helmets. Copper helmets are more likely since there was certainly enough of the metal available to issue everyone with copper weapons. The victory monument to Naram-Sin, a rose limestone stele dating to the later Akkadian period (c. 2230 BC), depicts the King with two horns protruding from the sides of his helmet. Horns are surprisingly common on later Bronze Age helmets.

Arraphian helmets

These were called *gurpisu* and enough evidence was uncovered at Nuzi to make a decent reconstruction. They were made of bronze or rawhide scales laced to a foundation of leather or felt. Each helmet had between 140 and 200 scales (HSS XV 3). After measuring and weighing the scales, Kendall determined the weight of the various helmets noted in the texts:¹⁸

	Minimum weight	Maximum weight
140-scale helmet (HSS XV 5:12)	2.08kg	2.72kg
170-scale helmet	2.36kg	3.14kg

(HSS XV 5:17)		
190-scale helmet	2.55kg	3.42kg
(HSS XV 3:6, 21, 31)		
200-scale helmet	2.64kg	3.56kg
(HSS XV 5:3, 7)		

The above weights include a felt liner that was calculated to weigh about 90 shekels (HSS XV 208:9f.) or 756g (90 × 8.4g). A crest of feathers or horsehair would surmount these helmets and they had scaled cheek guards. (See the colour plates for a bronze reconstruction.) Another type of helmet mentioned in the Nuzi texts was made from woven reeds. One method of construction that would resemble some of the illustrations would be a plaited rope coiled into the shape of a helmet and perhaps attached to a leather or felt liner.

Egyptian helmets

These were called *dbn* but there are no extant physical or iconographical examples of them dating before the New Kingdom. Metal helmets are more likely to have been reserved for the elite, while less protective headgear was worn by infantry, though many illustrations show Egyptian infantry with no helmets at all. A relief in the Temple of Rameses II at Abydos shows a charioteer wearing what is probably a bronze helmet, since a head cloth can be seen underneath. There are more charioteers with helmets in the Rameseum reliefs. A relief of a procession dating to the reign of Horemheb depicts several foot soldiers in helmets. Herodotus describes Egyptian soldiers wearing 'plaited' helmets (*Histories* 7.89) but this is much later, during the Iron Age. There are some helmets illustrated in the tomb of Rameses III that resemble the plaited helmets worn by the Hurrians (see above) and they could have been constructed in the same manner.

Hittite helmets

These are fairly distinct in illustrations. They have a squat shape with an open face, a neck guard, and a plumed crest. It is likely that they were made from a single plate of beaten

bronze. They look similar in shape to the gold helmet found at Ur.

Aegean helmets

These provide the most variation. The earliest representations date to the Early Cycladic period (third millennium BC) and are conical in shape. No surviving examples have been found so it is impossible to tell whether they are organic or metallic. Some are depicted with horizontal lines which might be a simplified rendition of a scale construction, either metal, rawhide, or boars' tusks. Most illustrations between the 17th and 14th centuries show variations of the boars-tusk helmet. Homer gives a detailed description of its construction in the *Iliad* (10.261–265): [19](#)

... ἄμφι δέ οἱ κυνέην κεφαλῇφιν ἔθηκε
ῥινοῦ ποιητὴν πολέσιν δ' ἔντοσθεν ἱμάσιν
ἐντέτατο στερεῶς ἔκτοσθε δὲ λευκοὶ ὀδόντες
ἀργιόδοντος ὕδ' ἑαμέες ἔχον ἔνθα καὶ ἔνθα
εὐ καὶ ἐπισταμένως μέσση δ' ἐνὶ πύλῳ ἀρήρει.

... and he too put over his head a helmet
fashioned of leather; on the inside the
cap was cross-strung firmly
with thongs of leather, and on the outer
side the white teeth
of a tusk-shining boar were close sewn
one after another
with craftsmanship and skill; and a felt
was set in the middle.

Many examples have subsequently been found in the archaeological record, including at Knossos, Mycenae and Pylos; one was found with the Dendra panoply. They are a scale construction but, instead of metal or rawhide, the plates are made of boars' tusks. These are cut lengthwise and laced in alternating rows (between two and five) onto a foundation made of leather strips and lined in felt. Some cheek guards were made of tusks and others were of bronze. Crests were large and flamboyant, often made of horsehair. (See the colour plates for a reconstruction.) Between twenty and fifty boars would have been needed to make a single

helmet. Some illustrations show helmets with only a few boars' tusks, perhaps suggesting that additional tusks were added later as they were acquired. Their use seems to have been largely phased out by the thirteenth century. Some illustrations show circles rather than boars' tusks on the helmet. These could be a stylized version of the boars-tusk helmet or they could be showing a bezanted reinforcement (see 'Bezanting', p. 71).

Other Mycenaean helmets were made of bronze. They were usually conical in shape with cheek guards and large crests. One example was found at the New Hospital site at Knossos. The helmet was 1-1.5mm thick and weighs 909g without the padded liner. Some had various numbers of animal horns protruding just above the brow; two horns seem the most common. Both of Achilles' helmets in the *Iliad* had four horns (16.794; 22.314). Horned helmets are depicted on the 'Warrior Vase'. Two horns made of lead were found at Mycenae and are likely to have been attached to a helmet. Homer describes many of his helmets as 'hollow-eyed' (αὐλῶπις) but the classical Corinthian full helm did not appear for many centuries later. It is likely that Homer was describing the effect of a helmet with a nasal guard and wide cheek guards. This would cover most of the face except for the eyes, the mouth, and the chin.

Illustrations show other helmets that are difficult to interpret. One has been dubbed the 'hedgehog helmet' because spines seem to be sticking out of it. Another is the 'feather helmet' because feathers come out of the top, though it could just as easily be depicting hair coming up through a headband.

Horse Armour

Scale armour was sometimes used to protect horses. The Nuzi texts indicate that the Hurrians used the following terms: the *gurpisu* protects the head and neck of the horse; the same term is given to human helmets. Sometimes the *gurpisu* was crested with a *suppuru*. The *milu* is an armoured section that covers the withers of the horse. It is padded so that the chariot harness (collar, bellyband, and rein rings) can rest here without causing discomfort to the horse. The *paraššannu* is a padded trapper made of soft leather or felted hair which covered the horse's back from the withers to the

loin and protected the flanks. It could serve as light armour or as an under-layer for a second trapper called a *sariam*, which was made of metallic or leather scales, similar to human body armour of the same name;²⁰ *binnatu* seems to be some sort of limb armour, perhaps a leg guard that reached to the knees,²¹ though illustrations are lacking which show any kind of leg armour for horses.

It is likely that horse armour (*sariam ša sisi*) was usually made of leather scales but metal was sometimes used. The Nuzi texts describe one barding that consisted of 'one suit of armour for a horse whose *milu* is of copper and whose *binnatu* are of copper' (HSS XV 145:7). Another mentions 'one copper *sariam* for a horse complete with its *gurpisu* and its *milu*, all of which are copper' (HSS XIV 616:1f.). Kendall believes that the largest scales found at Nuzi were probably intended for horse armour. They were rectangular in shape, measuring 109 × 64 × 2–2.5mm, and weigh around 50g.

Defensive Capability of Bronze Age Armour

One reads about many modern tests that attempt to measure the protective capabilities of historical armour.

Unfortunately, these tests are rarely performed accurately enough to provide useful data. This section will examine some of the more constructive tests, to show that Bronze Age armour did indeed provide very good protection against the weapons of the time.

The most commonly cited test was published by John Coles in 1962. This is unfortunate as Coles' experiment was carelessly conducted and his flawed results have led to specious conclusions about bronze armour and shields. (For discussion in more detail, see the chapter on *Shields*, p. 87.)

Barry Molloy has performed one of the better sword tests.²² He tested two replica swords against several targets: one was a piece of baked and waxed vegetable-tanned leather; another consisted of ten layers of linen soaked in animal hide glue; and a third was a plate of 1.5mm bronze (gilding metal). While none of the armour simulants was compromised by sword cuts, both the leather and linen targets were penetrated by thrusts; the bronze plate, however, remained undamaged by thrusts from swords, spears, or thrown javelins.

Unfortunately, Molloy's two organic test pieces are flawed. It has been noted above that linen armour was unlikely to have been glued, so testing a quilted target would have been more useful. The leather target also has problems. Wax-impregnated leather makes very poor armour since the wax lubricates the weapon and helps it to slide through the target. Other hardening methods involving hot water or ovens are far more suitable for making armour. Even rawhide would have been preferable to waxed leather.

Alan Williams has done some useful testing against both leather and linen armour.²³ (His work also includes detailed tests against iron mail and plate armour but these are beyond the scope of this book.) The first test involved quilted, layered linen weighing 171g and measuring 12.5 × 15cm. He proceeded to measure the amount of energy required for a simulated blade to cut through various layers: 100J = 5th layer; 120J = 9th layer; 140J = 16th layer; 160J = 23rd layer; 180J = 26th layer.

Williams also lists the amount of energy that can be delivered by various types of weapon. For example, an axe or sword can deliver 60-130J; a 12th century bow can deliver 80J; and a 13th century crossbow can deliver 100-200J.²⁴

Another of his tests involved targets of quilted linen and hardened leather, and two weapons, the above blade edge and the head of a spear or lance. The linen consisted of sixteen layers (weight 60g) and the hardened leather was 5mm thick. The blade required 80J to penetrate the linen and 90J to penetrate the hardened leather. The lance head required 50J to punch through the linen, but only 30J to punch through the leather. From this, one could conclude that both layered linen and hardened leather provide adequate protection against sword cuts, but layered linen is far better than hardened leather against weapon points.

Compared to the first test, this linen example offered less resistance to the blade. When the linen was thickly layered, the 100J blade only reached the fifth layer, but when it comprised only sixteen layers, the blade required only 80J to cut all the way through. It could be that the thicker padding provided a cushioning effect, so that the blade required much more energy to cut through a similar number of layers.

Tom Hulit has done the best tests against Bronze Age scale armour. The first one was done as part of his Ph.D.

dissertation, and he performed a later test for a documentary about chariot archers.²⁵ He selected one of the more commonly found scales (65mm × 22mm × 1.5mm) and made a replica using the same lacing pattern that was found on Tutankhamen's corselet. He made scales in both bronze and rawhide and assembled three reconstructions: one was made entirely of bronze; one was made entirely of rawhide; and a third was made with alternating rows of both materials. Although no weights were listed, he notes that the composite bronze/rawhide construction weighed 42 per cent less than the corselet made entirely in bronze. He used a replica Egyptian composite bow with a draw weight of 18–20kg at 760–840mm. Arrows were made from cane with hardwood feet and bronze or ebony heads; others were made from ramie. Arrow weights varied between 54g and 80g. (for more details see 'The Bow', pp. 27–30.) ²⁶

The original test was conducted at a short range of seven metres with the armour tied around a martial arts punching bag. Even at this distance, the bronze armour was not compromised, but damage involved bent scales and torn lacing. The bronze arrowheads were bent or curled, while the ebony ones were cracked and dulled. The composite bronze/rawhide armour also resisted the arrows, which suffered less damage against this target; the scales and lacing also suffered less damage. The arrows were more successful against the rawhide reconstruction with the lighter generic bronze head penetrating to a depth of 15mm and the heavier leaf-shaped point penetrating to a depth of 63mm. Note, however, that even a depth of 63mm is not enough to inflict a fatal wound.

The second series of tests was conducted at Cairo at the even closer range of five metres. The bronze corselet still resisted the arrows, but the resistance of the composite bronze/rawhide assembly depended on whether a bronze or rawhide scale was hit. If a bronze one was hit, the arrow would be repelled; if a rawhide one was hit, the arrow would penetrate but would be stopped by the bronze one that was underneath, as the rows of scales overlapped each other. Cane-shafted arrows shattered on impact.



1. A replica of the bronze panoply found at Dendra, dated to

the 14th century BC. (From the author's collection.)



2 (left). A replica of the boar's tusk helmet found at Mycenae made by Andrew Walpole. The crest is made of horsehair and cheek guards are bronze. (From the author's collection.)



3 (below). Replicas of the bronze greaves found at Kalithea along with looped bronze wire, which is used as anchor points for the lacing. Under the bronze plate is a reconstruction of larger linen greaves as depicted in some Mycenaean illustrations. (Armour made by Matt Amt. Photo courtesy of Matt Amt.)



4. A replica of a polished and hilted Mycenaean Type G sword made by Jeroen Zuiderwijk. The prominent midrib helps strengthen the blade and makes it easier for molten metal to flow along the mould when casting. (Photo courtesy of Jeroen Zuiderwijk.)



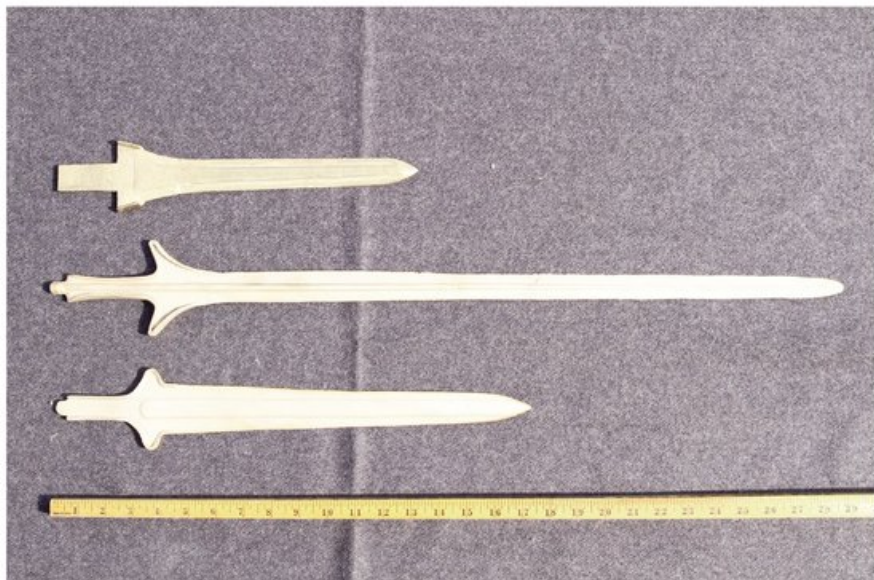
5. A replica of a Mycenaean Type B bronze sword made by Matt Amt: rough finished from the mould (top); polished and hilted (bottom). (Photo courtesy of Matt Amt.)



6. Replicas of a Mycenaean Fi Type sword made by Barry Molloy and a Naue Type II made by Neil Burridge. These unfinished bronze blades have been taken from the mould and had their edges cleaned up. (Photo courtesy of Brock Hoagland.)



7. A replica of a Naue Type II sword made by Neil Burridge. Note the riveting on the hilt and the large wooden pommel. (Photo courtesy of Brock Hoagland.)



8. Three unfinished Aegean bronze blades, Type B, Type Ci and Type Di. (Photo courtesy of Brock Hoagland.)



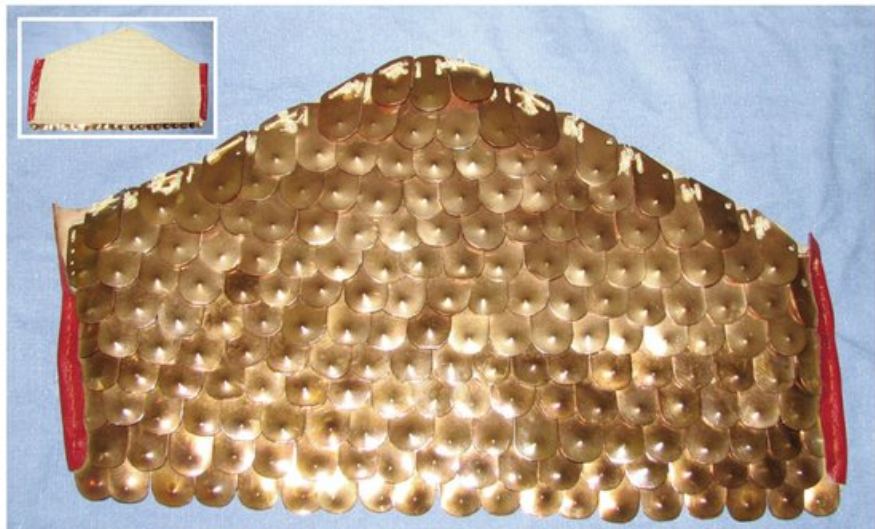
9. Replicas of three of the swords found at Arslantepe, Turkey, made by Jeroen Zuiderwijk. The originals have been dated to the end of the fourth millennium BC, which makes them the oldest swords in the archaeological record. The replica alloy is 4% tin bronze, while the originals contained arsenic. The silver inlay triangular decoration is the same as on some of the originals. (Photo courtesy of Jeroen Zuiderwijk.)



10. A reconstruction of an Egyptian bronze helmet based on Egyptian illustrations. It is lined and edged in goat leather, stitched with gut and dyed with cochineal. The bronzework was done by Craig Sitch and the leatherwork was by Todd Feinman. (Photo courtesy of Todd Feinman.)



11. A reconstruction of an Egyptian bronze khopesh made by Jeroen Zuiderwijk. (Photo courtesy of Jeroen Zuiderwijk.)



12. A reconstruction of Egyptian scale armour made by Todd Feinman. It consists of embossed bronze scales laced to four layers of quilted linen and edged in red leather. The insert shows the same armour from the back. (Photo courtesy of Todd Feinman).

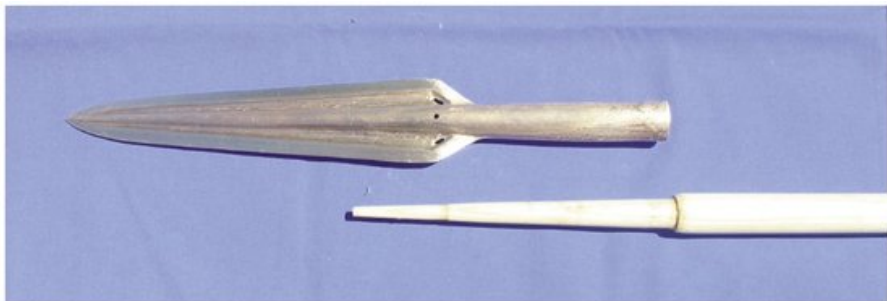


13. The sleeve of a reconstructed Egyptian scale armour

*made by Matt Amt. Note the raised central rib on each scale.
(Photo courtesy of Matt Amt)*



14 (left). A reconstruction of a Mitannian/Arraphian bronze scale helmet made by Todd Feinman. (From the author's collection.)



15 (middle) and 16 (bottom). A bronze spearhead and shaft before assembly and after being assembled and secured with a leather thong. (Photos courtesy of Brock Hoagland)

In addition, Hult tested several piercing axes (see 'Axes', pp. 30–33) against the above armour. He discovered that the armour was severely damaged by the attacks, with deformed scales, broken laces, and complete rows sometimes coming away from the backing. Next he tested the linen backing by itself and found that it resisted the axe blows very well, with only the first of six layers being cut. He concluded from this that, firstly, the victim would have suffered from internal injuries from the axe, but his skin would not have been cut, and secondly, the textile armour may have been far more widespread than the surviving evidence might suggest.

Henry Blyth conducted some detailed arrow tests against Greek bronze plate armour and shields.²⁷ The work is a little dated (1977) and the context was later, on equipment worn during the Persian Wars, but the results are relevant and can be applied to plate armour worn during the Bronze Age, since they were of a similar thickness and composition. After detailed analysis of the metallurgical and mechanical properties of bronze helmets and armour, and performing

tests both in the laboratory and with various reconstructions, he concluded that an arrow had the best chance of compromising Greek armour, while spears and swords were ineffectual. After testing various arrows and bows against several types of bronze plate, he concluded:[28](#)

A Greek hoplite could quite happily rely upon his bronze helmet to keep out both Persian and Scythian arrows, and on his breastplate and greaves, if he wore them. On the other hand, his armour was far from complete, and the eyes, right arm, and the neck were particularly vulnerable. His shield would provide adequate protection against arrows from the Scythian bow ..., but not, at short range, against those from the Persian infantry bow.

He calculated that a 'bodkin' arrow would need the following energy to begin penetrating bronze plate (4mm diameter): 0.75mm plate = 16J; 1mm plate = 28J; 1.25mm plate = 41J; 1.5mm plate = 53J. He recommended adding up to 40 per cent if the armour had been hardened by further working.[29](#) Note that this is the amount of energy required for the point to be barely visible on the other side. The arrow would need much greater penetration in order to cause significant injury. Blyth suggests that an arrow would need to hit the armour with at least 60J of energy.

It can be seen that Bronze Age armour was perfectly capable of protecting a warrior against all of the most common threats on the battlefield. It should also be noted that it was not heavy enough to seriously restrict movement. The two main problems with heavy armour were the expense of such a panoply and the stifling effects of wearing it while fighting, but the latter is largely limited to enclosed helmets.

Chapter 5

Shields

The shield is probably the earliest, and definitely the most common, piece of defensive equipment ever used on the battlefield. Shields of some kind were used by virtually every culture that engaged in battle. Not everyone wore body armour or even a helmet but most soldiers carried a shield. It was a cheap and effective means of protection, and an essential piece of military hardware. The size and shape of the shield depended on the type of weapon being resisted and how manoeuvrable the troops needed to be; large, heavy shields meant slower fighters. Generally speaking, larger shields were better against missiles while smaller shields were preferred for hand-to-hand fighting. Molloy has said that ‘a shield is a piece of defensive weaponry, not an element of defensive armour’.¹ It differs from armour in that it doesn’t provide passive defence. The bearer must actively interpose the shield into the path of an attack.

Even though the shield was primarily defensive, it was also part of the warrior’s offensive arsenal. Stepping forward into an opponent’s space can throw him off-balance and interfere with his ability to strike. In addition, the rim of the shield is a thin, almost blade-like edge that can be used to attack an opponent in, say, the face or throat. The domed central boss of many shields presents another tool which the shield-bearer can smash into his opponent. Some bosses were made conical so that the point could deliver an even more devastating attack.

Given the perishable materials from which most shields were made, it isn’t surprising that there are few examples in the archaeological record. We must rely on iconographical and other, less direct evidence. During the Neolithic Period there is little evidence for shields. The ancient settlement of Jericho, for example, shows evidence of combat from the Late Neolithic period onwards but the earliest evidence for shields

is during Jericho's early Bronze Age where a small illustration on a tomb wall shows two men armed with spear and shield. It is likely that this illustration was done by Amorite invaders, who conquered much of the Middle East between 2300 and 1900 BC, and not by the original inhabitants of Jericho. The earliest physical evidence for shields dates to the same time period. A surviving Mari shield was constructed of reeds and covered in hide (see 'Sumerian Shields', p. 89). A wooden mould for making leather shields was found in Kilmahamogue, Ireland, and has been radiocarbon dated to the first half of the second millennium.²

However, it is sometimes possible to infer the existence of shields when there are no physical or even iconographical remains. Some Neolithic fortified settlements have baffled gates which are arranged so that anyone entering must expose his right side, the unshielded side, to defenders, suggesting that shields may have been used much earlier than previously assumed.

There are many different ways to make a shield. Larger shields have to be made of lighter materials and so are usually constructed from woven wicker, or hide stretched over a frame. These are able to cover most of the body but are susceptible to javelins and arrows at short range. Smaller shields can be thicker and more capable of stopping most weapons. These involve close-grained timber or multiple layers of animal hide. Some are faced with a thin sheet of copper-alloy or made solely from a thicker plate of metal; the larger the shield, the thinner the metal, otherwise it becomes too unwieldy. Malloy has observed that smaller Irish shields are around 300mm in diameter and 0.8–1.5mm in thickness, while the larger variants are 650–700mm in diameter but only 0.6–1.2mm in thickness. Most seem to be around 0.7–0.8mm thick and 1.5–2.0kg in weight.³ Full-height shields, covering neck to shin, seem to have become less common by the end of the Bronze Age, when smaller, more manoeuvrable shields, especially circular ones, were becoming prevalent.

Many early large shields do not seem to have had a handgrip. Both hands needed to be free to wield a long, two-handed spear, so a neck strap (or 'guige') was used to control the shield. Herodotus describes how they are used:

it was the Carians who originated wearing crests on their helmets and devices on their shields, and who first made grips for their shields; until then all who used shields carried them without these grips, and guided them with leather belts which they slung round the neck and over the left shoulder. (*Histories* 1.171.4)

Note also that Herodotus attributes the invention of shield grips to the Carians and reckons that, before that time, all shields were controlled by means of the guige. Most images show these shields on the back of the user but some show them swung around to meet a threat. This move would require a twisting motion from the entire upper body, from the shoulders down to the waist and hips. Combat position would involve the fighter standing side-on to the attacker with the spear held underarm in both hands and the shield over his shoulder, covering his entire left side, which is facing the attacker. The convex shape meant that it partially wrapped around the user, protecting some of his back and front as well.

Sumerian Shields

The Stele of Vultures depicts a tight formation of helmeted spearmen bearing full-height rectangular shields. Each shield appears to have six bosses on it and next to each shield is a vertical column of six spears wielded in six pairs of hands. Hamblin interprets this as a seven-man deep formation where the front man carries a shield and the six men behind thrust their spears between the shields.⁴ But the men are depicted from the side not the front. The fact that the shields are depicted with six bosses suggests an alternative possibility. One would expect at least one boss to be in the centre of the shield to protect the hand. If so, then perhaps the artist was attempting to represent a line of six men in each rank all carrying a shield with a single boss. So each six-bossed shield actually represents six individual shields, one behind the other, and every shield having only one boss. The other anomaly is the fact that each spear is gripped in both hands leaving none to wield the shield. This could mean

that there is a separate shield bearer, as suggested by Hamblin, or it could mean that the spearmen wielded their shields by means of a neck strap. We have evidence of other cultures wielding full-height shields while carrying two-handed spears. The Mycenaean 'Lion Hunt' dagger depicts these shields being controlled by means of such a neck strap (see 'Mycenaean Shields', p. 92).

Regarding construction, there are no surviving Sumerian shields nor are there any illustrations that are detailed enough to give any clues. There is a surviving Mari shield dating to a similar time period; it was made of large reeds covered in hide, but it doesn't have a boss. Mycenaean shields were also covered in hide and it is speculated that they were made of a wicker construction (see below). Since each warrior wielded his spear in two hands one can assume that the shield had a guige, but if the shield had a central boss then there is likely to have also been a central hand grip behind it for more controlled manoeuvres.

By the end of the Bronze Age, shields in this region were mainly circular. Two bronze shields were excavated from the cemetery at Marlik in Luristan (western Iran) and dated to this period. Each was circular in shape with a central boss. It is unlikely that a thin sheet of bronze formed the sole component of the shield, so it is probable that they were simply the outer facing of the shield, which itself was made of wood and/or hide. Negabhan supports this conclusion and notes that their diameters are 22.5cm and 37cm respectively.⁵

Mitannian/Canaanite Shields

Mitannian shields are called *aritu* in the Nuzi texts.⁶ The texts also say that they were made by leather workers (*askapu*); shields were assembled from leather and copper-alloy and seem to have been issued to all kinds of troops, including some charioteers. Egyptian reliefs indicate that they were similar to those wielded by Syrians and Canaanites; small (the largest would be about 30cm by 60cm), rectangular, wielded by a central hand grip, and decorated with copper-alloy rivets in geometric patterns. Some have small triangular cut-outs in the top and bottom edges. This shape may have been determined by the animal skin with the four shoulders of the hide stretched out at the

corners. Shields are sometimes depicted slung over the shoulder when not in use. One text describes a 'chariot shield' (HSS XV 167:22) implying that there was, perhaps, a different kind of shield for infantry.

Egyptian Shields

During the Predynastic Period Egyptian shields depicted in paintings are remarkably similar to the earliest Mycenaean shields (see p. 92). They were rectangular, full-height and apparently covered in the hide of cattle. The hide patterns that are depicted on Mycenaean shields are also depicted on these early Egyptian shields. The Egyptian word for 'shield' is *ikm*, which can also mean 'skin' or 'hide', so we can be pretty sure of the material from which their shields were made. The reliefs of Akhtoy depict thirty soldiers wielding these large shields. It is likely that they were primarily used as protection from enemy arrows and were large enough to cover both an archer and the shield bearer. It is unclear how they were carried but it is probable that a guige was used in a similar manner to other full-height shields of the time.

There is also some limited evidence for shields made of turtle shells in Predynastic Egypt. A slate grinding palette known as the 'Hunters Palette' dating to the Late Predynastic Period (c. 3100 BC) shows a scene of hunters with those on the right side carrying small, irregularly-shaped circular shields that have been interpreted as turtle shells.⁷ The various irregular shapes make it unlikely that they were a man-made construction.

During the second millennium, shields became smaller. Some Middle Kingdom shields had a rounded top, a flat bottom, and sides that tapered slightly towards the bottom. They were made of wood covered in animal hide, and some had a bronze boss. Other shields had a flat bottom and curved to a point at the top. Hamblin suggests that this was to allow warriors to peer through the gaps that were left when locked in a shield wall.⁸ A cross-beam hand grip is located about a third of the way down, behind the boss. Depictions of these shields were found in the tombs of Mesehi and Beni Hasan. They are large enough to cover a man from neck to knees. Cattle skin was a common covering but more expensive hides were sometimes used. For example, two of the shields found in the tomb of

Tutankhamen were covered in cheetah skin. Tutankhamen's shields have a slight curvature but the handles are missing so it is unclear how they were attached. Middle Kingdom shields still had guiges but they were used solely to sling them on the back when marching. When in battle the shield was controlled by means of a horizontal hand grip located about a third of the way down from the top. When in camp many of the infantry shields were placed around the perimeter as an improvised fence. At one point during the Battle of Kadesh the Hittites managed to reach the Egyptian camp; the Egyptian account says that the enemy crashed through the perimeter of shields and into the tents.

Illustrations show shields sometimes being wielded by charioteers also. When advancing to battle, the archer carried the shield, transferring it to the driver once combat commenced and the warrior needed both hands for his bow. Yadin believes that charioteers used two different shields, one made of leather-covered wood and the other of plaited reeds.⁹

Circular shields were not used by Egyptian regulars, but auxiliaries and mercenaries sometimes used them, including the 'Sea Peoples' and the Nubians. By the time of the New Kingdom, shields were sometimes edged and faced in bronze. An excavation at Qantir in the eastern Egyptian Delta uncovered a workshop that had eight limestone shield moulds measuring 1.25m × 1.25m.¹⁰ These were used by armourers to hammer out the bronze shield facing. Strangely, they were not rectangular like Egyptian shields, but were shaped like the Hittite scalloped shield (see below). This suggests either that some Egyptian troops were using Hittite-style shields, or that Egypt was making (or repairing) these shields for Hittite use. Pusch believes that the most likely date for the moulds is during the 34-year marriage between Rameses II and the Hittite princess called Maat-hor-neferu-ra on a stele at Abu Simbel.¹¹ A boar's tusk, fashioned in a manner similar to the components of a Mycenaean helmet (see 'Aegean helmets', pp. 82-83), was also found, suggesting that the workshop serviced foreign mercenaries in the Pharaoh's army.

Another type of shield that has survived is the 'parrying shield' (*mks*). It is basically a long, slender piece of wood with a vertical handle in the centre and a dish to protect the hand. Sometimes these are misidentified as shield handles,

perhaps confusing them with the long spines of some Mycenaean ‘figure-8’ shields, which did not have handles at all. The one misidentified by Nibbi even shows evidence of combat damage along its surface.¹² These devices could be used for both defensive and offensive moves, but are of limited use on the battlefield because they can’t block missiles. Similar shields were used throughout the world, including India, Africa, Indonesia, and Australia.

Hittite Shields

The Hittite word for shield is *kurša*. Just as in Egyptian, this word can also mean ‘skin’ or ‘leather’, so it is fairly certain that their shields were made from animal skin. The hide was probably stretched over a wooden frame like the shields of other contemporary cultures. During the reign of Rameses II there was an alliance with the Hittites; Rameses II had married the eldest daughter of the Hittite king Hattusili III. It is likely that the Egyptians were making and repairing Hittite shields during this time, because shield moulds with Hittite motifs have been uncovered by archaeologists in Egyptian workshops (see ‘Egyptian Shields’, above). One could conclude that Egyptian and Hittite shields were of a very similar construction, at least during this time.

Depictions of Hittite shields in Egyptian reliefs show them to be used mainly by the charioteers. They covered from neck to thigh and are roughly rectangular with convex top and bottom edges and concave sides, like a circle with a scallop in each side. They were wielded by means of a central hand grip. Surprisingly, the Egyptians do not depict Hittite infantry with shields.

The Hittites didn’t adopt round shields until the Neo-Hittite period at the end of the Bronze Age. Several rock-carvings, including one from Tell Halaf in Syria, depict Neo-Hittite cavalry with round shields.

Mycenaean Shields

Up until the Late Bronze Age, virtually all Mycenaean shields were full height, covering a man from neck to ankle. If we look at iconographical evidence, there are four main types: the earliest is rectangular in shape, followed by the ‘tower’

shield, which usually has a rounded top edge, and the 'figure-8' shield; the fourth is the 'proto-Dipylon' shield, which is ovoid in shape but has two scallops cut out of the sides. The function of these scallops is unknown since there are no illustrations showing how they might have been employed. Some have speculated that they were meant to accommodate a spear when the troops were lined up in formation but this is unlikely. It is clear that the spears of the time were of the two-handed variety, physically impossible to wield so that they would pass through the gaps created by the shield scallops.

The earliest Mycenaean shields are seen in a wall fresco in the settlement of Akrotiri on the island of Thera. It was painted before the volcanic eruption on that island which has been dated to the sixteenth or seventeenth century. In the painting, warriors are depicted wearing boars-tusk helmets and carrying full-height rectangular shields. The patterns on the shields strongly resemble the spotted hide of cattle, which are depicted in the same fresco. This not only suggests that the shield was faced in hide, but that the animal fur was left intact.

The 'figure-8' shield is first depicted in frescos at Knossos. It was probably constructed out of a hide-covered wicker frame reinforced with additional wooden cross-stays. There are two forms of this shield. The first has a double-concave shape as depicted on the Battle Krater from Mycenae and various seal images. A silver model of it was found in Grave Shaft IV at Mycenae and other similar models were found made from ivory. The second form does not have the double-concavity. It is depicted on the 'Lion Hunt' dagger and some seal-stone images.

The 'tower' shield is rectangular in shape except for the rounded top edge. Like the other shields it is likely made of wicker and covered in hide. It is depicted on the 'Lion Hunt' dagger and the Battle Krater and a few seal images.

Like the Sumerian depictions (see above), the warriors bearing these full-height shields wield two-handed spears, suggesting that the shield was controlled by means of a guige. There are two surviving depictions of Mycenaean warriors in which the back of the shield is depicted. The most famous is the 'Lion Hunt' dagger, found in a grave shaft at Mycenae, which shows five men hunting a lion ([Figure 12](#)). One carries a bow and the other four carry full-height shields

and two-handed spears; two bear the 'figure-8' shield and two have the 'tower' shield. The two figures on the left are presenting the back of the shield to the viewer in which the guige is clearly visible on the neck and shoulder. The other scene is on the Battle Krater also found at Mycenae in which two groups of men are fighting.¹³ Both are equipped in the same way, with boars-tusk helmets, full height shields, two-handed spears, and bows. Only the archers are not carrying shields. As in the 'Lion Hunt' dagger, the shields are 'figure-8' and 'tower' typologies and one of them has its back to the viewer; the guige is again clearly visible over the neck and shoulder.

At some point shield grips were introduced, which gave more versatility to their operation. This is likely to have coincided with large central bosses to protect the hand. By the end of the Bronze Age, around the time of the alleged Trojan War, we start to see more variety in the shields used by Mycenaeans. Circular shields become more common and smaller shields start being used. They were also more commonly faced in bronze rather than hide. Egyptian depictions of Sea Peoples (who are widely regarded to be at least partially composed of Mycenaeans) show them bearing circular shields. Based on illustrations there are four main types of shield: round and possibly concave shields; round shields with a scallop or V cut-out at the base, as illustrated on the 'Warrior Vase'; oval shields as depicted on both the 'Warrior Stele' and 'Warrior Vase'; and a shield with scallops cut from both sides. Despite commentaries to the contrary, all of the shields described in the *Iliad* are circular in shape (for a detailed analysis, see 'Homeric Shields', p. 97). Smaller ones may have been made from solid wood, but larger ones were probably still being made from one or more layers of hide.

Defensive Capability of Bronze Age Shields

The most commonly cited shield test was published by John Coles in 1962.¹⁴ His target was a thin piece of copper plate; its 0.3mm thickness was based on several extant bronze shields, such as the one from Coveney Fen, which were of a similar thickness. Not surprisingly, the thin sheet of copper was easily cut by the sword he used. Ever since, authors have cited this test to demonstrate the ineffectiveness of bronze

shields and armour. However, this conclusion is easily shown to be unfounded. Firstly, the so-called 0.3mm shield was likely to be merely the facing for a leather or wooden shield; it was part of a composite construction and never intended to be used on its own. Shields made entirely of metal were considerably thicker. Secondly, Coles tested soft copper while most shields and armour were made of harder alloys that had been worked even harder. Despite its shortcomings though, Coles' test does contribute to the body of evidence. The main conclusion one can draw is that Bronze Age shields cannot have been made solely from 0.3mm-thick copper. Any extant finds of this type must be more thoroughly examined to see if any trace of a wooden or leather backing remains. Homer describes many examples of these shields in the *Iliad* (for more detail, see 'Homeric Shields', p. 97).

As discussed in the armour chapter, Henry Blyth performed tests against both bronze armour and hoplite shields using composite bows and spears (see 'Defensive Capability of Bronze Age Armour', pp. 84–86). His test pieces were made of 9mm gaboon ply and 12mm birch ply. He concluded that the gaboon ply was almost thick enough by itself to protect against thrusting spears but was highly vulnerable to arrows. The 12mm birch ply with a thin facing of bronze would require more energy to penetrate than a person could deliver with a spear or javelin and so was safe from injury. However an arrow shot from a heavy bow at close range could penetrate far enough to injure the shield-bearer.¹⁵

Molloy performed some tests against replicas of some Irish and European Bronze Age shields.¹⁶ Firstly he cited examples of bronze shields with clear evidence of battle damage, proving that at least some all-metal shields were used in combat. He constructed three copper shields and one made from leather. The leather shield was 3.5–4mm thick, which is slightly thinner than the Clonbrin shield, which is 4–5mm thick. It measured about half a metre across with embossed ribs about 7–10mm deep running around in concentric circles. There are small bosses in groups of three around the shield and a large central boss with a hand grip behind it. A second piece of 2mm leather was sewn over the boss to give additional protection to the hand. This leather shield was repeatedly hit with a sword around 25 times. Most of the strokes were to the upper right-hand quadrant, which began to degrade and bend back around the arm of the user.

If the shield was used to deflect the blows rather than stop them directly, the only damage involved small surface cuts. One-handed thrusts delivered to the shield also failed to penetrate. Flint, obsidian, and bronze arrowheads were shot from a 35–40lb Irish recurve bow at a range of 10m. All penetrated the shield, but only by 80–100mm, so not far enough to threaten the shield bearer. The tip of the javelin penetrated but not the whole head. Many of the surface marks on the shield after testing were consistent with those found on the original artefact.

More comprehensive testing was done against the three copper shields, which were around 0.9mm thick. The first measured 320mm in diameter, the second 378mm, and the third 710mm. Molloy used pure copper, which is softer than the alloys from extant shields. Even so, after repeated tests and demonstrations, the shields needed little more than cosmetic repairs. Cuts to the flat rim of one of the shields penetrated up to 15mm into the edge, while cuts to the shields with rolled rims did not cut into the edge at all, but only dented it. Spear throws and thrusts sometimes penetrated slightly but never far enough to potentially injure to the user. They also tested a 35lb bow at a distance of 10m using arrows tipped with flint and bronze. None of them penetrated and this is consistent with Blyth's results.

Erhard Godehardt and his colleagues tested a replica Scythian bow against a Roman *scutum* and a woven cane shield.¹⁷ While the Scythian bow is shorter than earlier Bronze Age composite bows, the power it can deliver is as good as, or even better than, Bronze Age examples, and its arrows have a higher speed than longer bows. Bows were made of osage orange timber with a sinew backing, and composite bows of horn and sinew with an osage or mulberry core. At a draw-length of 60cm, stored energy in the lightest bow was calculated to be 46.51J and in the heaviest one 51.22J. A preliminary test involved a reconstructed Roman *scutum* made of four layers of laminated wood of 12mm thickness. The arrows had iron heads of various shapes and were shot from a range of 12m. The first round of five arrows never penetrated more than 5cm but subsequent rounds penetrated further as the structure of the shield broke down. The narrow kite-shaped arrowheads penetrated the best.

The next test involved a cane shield that was modelled on one found at Dura-Europos. It was made by vertically

weaving canes through slitted rawhide. When dry the construction was light and hard, yet resilient. It measured approximately 1100mm × 650mm × 7mm. This time, only the arrowheads that performed the best in the previous test were used. They included the trilobate arrowheads, 'bodkin' arrowheads, and narrow kite-shaped arrowheads; they also included the small bronze arrowheads that were commonly used by Scythians. The bodkin and kite-shaped arrowheads performed the best. The authors observe that 'the cane shield showed virtually no protective mechanism against these arrows'.¹⁸ The rest barely penetrated at all.

As with all tests of this kind there are a lot of variables. The authors note that penetration was likely to have been better if the bows were at 'full draw' but the range at which most of these tests are performed is very short. Most arrows on a battlefield would have been shot from distances far greater than twelve metres. In any case it seems that the best shields involve metal; either they are made entirely of metal at least 0.7mm thick or are a composite construction of wood and leather with a thinner bronze facing.

Appendix 1

Homeric Shields

A lot of misinformation has been promulgated by various scholars about Homeric shields and it seems that it might be a good idea to address these myths and misconceptions by examining what is actually written in the *Iliad* and retranslating relevant passages with a military and literal mindset rather than an artistic one. In order to do this one must make the assumption that the author was describing real physical items, even if the events described in the epic didn't actually occur as written.

Lattimore's translation will be used most of the time but less embroidered interpretations will be used when necessary.¹ There are several issues to address: the first is that Homer uses the term *sakos* to describe large shields and *aspis* to describe smaller shields; the second is that Homer's characters use two shields that have been found in the archaeological record—namely the 'tower' shield and the 'figure-8' shield (see 'Mycenaean Shields', p. 92); third, it will be shown that the shield actually described in the *Iliad* does not resemble any of the commonly cited shield typologies.

Aspis and Sakos

In the *Iliad*, three words are used to describe shields: *aspis* (ἄσπίς), *sakos* (σάκος), and *rhinos* (ῥινός). *Rhinos* appears eleven times in the text, *sakos* appears sixty-seven times, and *aspis* appears ninety-four times. *Rhinos* usually refers to animal hide. Besides human skin (5.308), Homer uses it to refer to animal hide (7.474; 10.262; 12.263), the ox-hide on a shield (7.248; 13.406, 804; 16.636; 20.276), and the shield itself (4.447; 8.61). Homer uses *sakos* to refer to some of his shields, but the word can also refer to a sack or bag, possibly made originally of animal hair. One possible explanation is

that originally the word *sakos* was used to describe anything made from animal hair or hide with the hair left intact—including shields—and by the time of Homer, the word was commonly associated with any shield made of hide. *Aspis* is used to describe the rest of Homer's shields, but it was also the word used to describe the hoplite shield that was dominant in the Classical Period (also called an 'Argive' shield or, incorrectly, a *hoplon*).² It will be demonstrated, however, that Homer's round shield and the classical *aspis* are completely different shields. It is not possible to use the Linear B evidence to clarify matters, either. According to Chadwick, 'there appears to be no record in our tablets of shields. We have ox-hides, but they are used, as far as we can tell, for other purposes. There is no ideogram which looks like a shield, nor any word which can be equated with classical or Homeric words for various kinds of shield'.³ So there are no records of any word or symbol in the extant tablets that could be identified as 'shield'.

So, in regards to Homeric shields, it is not possible to trace the words used in the *Iliad* back to the time when 'figure-8' and 'tower' shields were in use. We simply do not know what terms the early Mycenaeans used to describe their shields. It is, therefore, necessary to rely solely on Homer's descriptions. In the following passage, Homer uses the word *sakos* to describe a small shield and *aspis* to describe a larger shield, completely contradicting the above proposition, that he used *sakos* to describe full-height shields and *aspis* to describe smaller shields.

ὅς δέ κ' ἀνήρ μενέχαρμος, ἔχῃ δ' ὀλίγον σάκος ὦμος
 χεῖρσιν φασὶ δότω, ὃ δ' ἐν ἀσπίδι μεῖζονι δύτω

Let the man stubborn in battle who
 wears a small shield on his shoulder
 give it to a worse man, and put on the
 larger shield (*Iliad* 14.376-77)

Also contradicting the suggestion that *sakos* describes a full-height shield and *aspis* a smaller one is Hektor's shield. Homer says that it touched both Hektor's neck and his ankles as he walked with it slung on his back (*Iliad* 6.117). This shield is clearly a full-height shield, yet it is called an *aspis*,

never a *sakos*. On seventeen occasions, Homer uses the word *aspis* to describe Hektor's shield; he never once uses the word *sakos*.

In the following example, Homer uses both *sakos* and *aspis* to describe the same shield.⁴

φράξαντες δόρυ δουρί, σάκος σάκει προθυλόμεν
ἀσπίς ἄρ' ἀσπίδ' ἔρειδε, κόρυς κόρυιν, ἀνέρα δ' ἀνῆλπε

locking spear by spear, shield against
shield at the base, so
shield leaned on shield, helmet on
helmet, man against man (*Iliad* 13.130–
31)

A further example is the use of both *sakos* (10.149, 257) and *aspis* (11.434, 435, 457) to describe the shield carried by Odysseus. It is abundantly clear that the *Iliad* does not use *sakos* to describe a large shield and *aspis* to describe a smaller shield. Nor does it use *sakos* to describe one type of shield and *aspis* to describe another. Both *aspis*⁵ and *sakos*⁶ are used to describe individual shields as well as being used as a general term for 'shield', regardless of its size or shape. The two words (along with *rhinos*) are used interchangeably, sometimes both describing the same shield. One likely explanation is that the author picked the word that best fit the metre of his poem rather than because of any typological distinction.

Aias

The hero who is alleged to have carried the 'tower' shield is Aias. Homer describes this shield in particular detail and the first characteristic that becomes evident is that this shield was more massive than those of Aias' companions. It is made of seven layers of ox-hide with an eighth layer of bronze (7.223, 246; 16.107). Since Homer seems to emphasise the seven layers on Aias' shield, one can assume that most shields were made of fewer layers. Teukros' shield, for example, is described as only having four layers (15.479), and it is likely that this was more typical of most shields. In the *Odyssey*, the shield of Laertes is also described as four-

layered (22.122). A suggested reconstruction of one of these shields will be detailed below (pp. 109–111). The following recurring line is erroneously cited as evidence that Aias carried the ‘tower’ shield:

Αἴας δ' ἐγγύθεν ἦλθε φέρων σάκος ἥτε πύργον (*Iliad* 7.219; 11.485; 17.128)

The only way this can be supported is if one uses an incorrect translation. For example, ‘Aias came up bearing his tower-like shield’. However, Samuel Butler translates it as ‘Ajax came up bearing his shield in front of him like a wall’.⁷ Lattimore’s version is ‘Now Aias came near him, carrying like a wall his shield.’ The phrase ‘like a wall (or tower)’ was not intended to describe the shape of Aias’ shield but seems to have been a literary device with a dual meaning. Firstly, the image of a city wall or tower conveys to the reader the great size of Aias’ shield. Secondly, the phrase adds to Homer’s other depictions of Aias as the metaphorical ‘tower of strength’. He specifically refers to Aias as ‘wall of the Achaeans’ (ἔρκος Ἀχαιῶν) on multiple occasions (*Iliad* 3.229; 6.5; 7.211).

Confusion arises about the following phrase: σάκος ἥτε πύργον. In particular, the definition of the word *pyrgon* (πύργον) since more modern Greek has a narrower definition (i.e. ‘tower’) and does not refer to walls or fortifications in general. Homer’s definition is more broad, though. *Sakos* (σάκος) means ‘shield’, and *êute* (ἥτε) is a particle most often used with similes; English examples include ‘as hard as a rock’, ‘eats like a horse’, etc. Regarding *pyrgos* (πύργος), Homer uses the word to refer to fortifications in general, not just towers; English translations could be ‘wall’, ‘tower’, ‘bastion’, ‘fortress’, ‘rampart’, etc. Homer also uses *pyrgos* to describe a close formation of troops as a substitute for phalanx (e.g. *Iliad* 4.334, 347), adding further weight to the argument that the word was intended as a metaphor to describe Aias himself, not just his shield.

The previously-mentioned phrase cannot be translated as ‘like a tower shield’ or ‘tower-like shield’. The only way ‘tower’ can be used adjectivally is if the two words were written in the same case and the particle was placed outside, not in the middle. In all three examples, Homer uses exactly

the construction one would expect if creating a simile: that is, ‘bearing his shield like a tower’. The only way the former translation would be correct is if Homer wrote both words in the subjective case and placed ‘like’ outside the construction; for example, *êúte sakon pyrgon* or *êúte pyrgon sakon*. Homer does not do this in any of the three occurrences. In all three, he uses *sakos êúte pyrgon*. Because Homer also uses the word *pyrgos* to describe walls (including metaphorical ones), an equally valid translation would be ‘bearing his shield like a wall’, and it is likely that this is the more valid interpretation due to Homer describing Aias as the metaphorical ‘wall of the Achaeans’. In other words, the combination of Aias and his great shield is ‘as a wall’.

It is clear that Butler’s and Lattimore’s translations are correct. The word *pyrgos* (πύργος) is used in a simile construction, and the phrase cannot be correctly translated to describe the physical shape of Aias’ shield. In fact, nowhere in the book does Homer indicate the shape of Aias’ shield. In addition, there is nothing to suggest that this shield was a different shape from any of the others. Its construction, using multiple layers of ox-hide faced with bronze, is exactly the same as the majority of other shields described by Homer. (The shield of Achilles is a rare exception, being made of multiple layers of metal rather than hide; see below.) To suggest that any shield in the *Iliad* was rectangular or ‘tower’ shaped is unfounded speculation. To suggest that Aias’ shield was somehow different from the others, except for its thickness, is equally speculative and unsupportable.

Hektor

The shield carried by Hektor is another that is described in some detail. It is distinguished by being the only shield specifically described as full-height. Homer says that it touched both Hektor’s neck and his ankles as he walked with it slung on his back:

ἀμφὶ δέ μιν σφυρὰ τύπτε καὶ αὐχένα δέρμα κελαινὸν
ἄντηξ ἢ πυμάτη θέεν ἀσπίδος ὀμφαλοέσεως.

and against both his ankles and his neck

clashed the dark hide,
the rim running round the edge of the
bossed shield (*Iliad* 6.117–18)

One could infer from this passage that not all shields in the *Iliad* were large enough to do this (touch the ankles and neck). Many have supposed that Homer must be referring to one of the two full-height shields in the early Mycenaean archaeological record; either the ‘tower’ or ‘figure-8’ shield. Connolly, for example, believes that Hektor carried a ‘figure-8’ shield.⁸ However, as with Aias’ shield, there is nothing in the text to suggest that this might be so. In fact, Homer specifically describes Hektor’s shield as circular on three separate occasions:

καὶ βάλε Πριαμίδαο κατ’ ἀσπίδα πάντοσ’ ἕισην

and struck the shield of Priam’s son on
its perfect circle (7.250; cf. 3.356)

Ἐκτορ δ’ ἐν πρώτοισι φέρ’ ἀσπίδα πάντοσ’ ἕισην

And Hektor carried the perfect circle of
his shield in the foremost (11.61)

Πριαμίδης, πρόσθεν δ’ ἔχεν ἀσπίδα πάντοσ’ ἕισην

Priam’s son, who held the perfect circle
of his shield before him (13.157)

As is evident in the above passages, Lattimore translates the phrase πάντοσ’ ἕισην as ‘perfect circle’; πάντοσε means ‘every which way’, and ἕισην means ‘equal’. So it could mean something like ‘equally balanced’. Another translation would be ‘equal in all directions’, and Autenrieth’s dictionary claims that the phrase can be a denotation of circular form.⁹ This seems to be the only logical interpretation of the phrase when used in the context of shields. It is unlikely to mean ‘ovoid’ and certainly cannot be translated to describe the shape of a ‘figure-8’ shield. Homer uses the same phrase to describe many shields in the *Iliad*, including those of

Menelaos (3.347; 17.7, 43), Aineias (5.300; 20.274), Odysseus (11.434), Sarpedon (12.294), Idomeneus (13.405), Aretos (17.517), and Diomedes (23.818). In the following passage, Homer gives a little more detail about Hektor's shield:

Πριαμίδης πρόσθεν δ' ἔχεν ἀσπίδα πάντοσ' εἰσὴν
ὀνοίοισιν πυκνὴν, πολλὸς δ' ἐπελήλατο χαλκός

Priam's son held the perfect circle of his
shield before him
fortified with skins, and a great fold of
beaten bronze (*Iliad* 13.803-804)

Hektor's shield is also described as 'shining' (*Iliad* 22.97) and 'bossed' (6.118; 22.111),¹⁰ just like virtually every other shield mentioned in the book. As with Aias' shield, it is pure speculation to suggest that Hektor's shield was 'figure-8' or 'tower' shaped since there is nothing in the text to suggest that it was anything other than circular. In addition, there is nothing in the archaeological record to suggest that 'figure-8' shields were faced with bronze or had central domed bosses. According to the *Iliad*, the only real difference between the shields of Hektor and Aias is that the latter was made of seven layers of ox-hide. If Hektor's shield was constructed of an equal number of layers, then it is likely that Homer would have emphasised the fact as he did with Aias. Considering that this didn't happen, one must conclude that Hektor's shield was constructed of fewer layers; a similar number to most of the other shields. The only other number we have is four,¹¹ and this seems to be a logical assumption.¹² A detailed reconstruction of Hektor's shield will be attempted below.



Figure 7. A seal found on Cyprus and dating to around 1200 BC. It depicts a warrior kneeling behind a large circular shield. Note the detailed embossing on the shield face and central boss.

Other Shields

Achilles

Much has been written about Achilles' shield, and it does not need to be repeated here except to say that it was unique, being intricately decorated and constructed of multiple layers of metal (two bronze, two tin, one gold) and not ox-hide. A detailed description is given in *Iliad* 18.478-607. It should be noted that this shield was circular like many of the others described by Homer.

Agamemnon

The Mycenaean king's intricately decorated shield is described as follows:

ἂν δ' ἔλετ' ἀμφιβρότην πολυδαίδαλον ἀσπίδα θοῶν
καλὴν, ἣν περὶ μὲν κύκλοι δέκα χάλκεοι ἦσαν,
ἐν δὲ οἱ ὀμφαλοὶ ἦσαν εἴκοσι χασιπτεροιο
λευκοί, ἐν δὲ μέσοισιν ἦν μέγανος κνάνοιο.
τῇ δ' ἐπὶ μὲν Γοργῷ βλοσυρῶπις ἑσπεφάνετο
δεινὸν δεσπομένη, περὶ δὲ Δαίμόν τε Φόβος τε,
τῆς δ' ἔξ ἀργύρεος τελαμών ἦν· αὐτὰρ ἐπ' αὐτοῦ
κνάνεος ἐλέγκτο δράκων, κεφαλὰ δὲ οἱ ἦσαν
τρὶς ἀμφοτρεφεῖς ἐνὸς αὐγένης ἐκπεφυῖαι.

And he took up the man-enclosing
elaborate stark shield
a thing of splendour. There were ten
circles of bronze upon it,



Figure 8. *The facing of a bronze shield found on Crete. Note the central boss shaped into the form of an animal head. Agamemnon's shield is described as having the Gorgon embellishing the centre of his shield.*

and set about it were twenty bosses of
tin,
pale-shining,

and in the very centre, another boss of
dark
cobalt.

And circled in the midst of all was the
blank-eyed
face of the Gorgon

with her stare of horror, and Fear was
inscribed upon it, and Terror.
The shield strap had silver upon it, and
there also on it
was coiled a cobalt snake, and there

were three heads upon it
twisted to look backward and grown
from a single neck, all three. (*Iliad*
11.32–40)

Once again, we see a circular shield with a heavily decorated bronze face.¹³ This particular shield is also described as ‘man-enclosing’ (ἀμφιβρότην), suggesting that it might be a full-height shield like Hektor’s. Other instances of this word being used to describe circular shields are that of Sarpedon (*Iliad* 12.402) and Aeneas (20.281). The boss in the centre is fashioned in the shape of the Gorgon in a manner possibly similar to the shield in [Figure 8.14](#)

Idomeneus

This shield is typical of those described by Homer, being constructed of multiple circles of ox-hide and faced with bronze. On this occasion, Homer adds one extra detail: κανών or ‘cross-stays’.

Ἰδομενεὺς κρύφθη γὰρ ὑπ’ ἀσπίδι πάντοσ’ ἔειπ.
τὴν ἄρ’ ὃ γε ῥινοῖσι βοῶν καὶ νόροισι χαλκῷ
διωτὴν φορέεσκε, δῶα κανόνεσσ’ ἀραρυίαν

Idomeneus was also hidden beneath his
shield’s perfect circle,
that shield he carried, hooped in circles
of glaring bronze
and the skins of oxen, fitted with double
cross-stays (*Iliad* 13.405–7)

The word κανόνεσσ’ from *kanôn* refers to two rigid rods that are used to help maintain the shield’s shape. One possible depiction of these rods is on the underside of the circular shield in [Figure 9](#). These rods are also mentioned in Homer’s description of Nestor’s shield (*Iliad* 8.193). Homer uses the same word (κανών) to describe a weaver’s rod (23.761).



Figure 9. One of the ‘Sea Peoples’ depicted at Medinet Habu carrying a large circular shield with a central handgrip and two reinforcing cross-stays. If the shield is to scale, then it appears to cover from neck to knee.

Teukros

The main thing to note about Teukros’ shield is that it was constructed of four layers (τετραθέλυμνον) of hide:

ὥς φάθ', ὃ δὲ τόξον μὲν ἐνὶ κλισίῃσιν ἔθηκεν,
αὐτὰρ ὃ γ' ἄμφ' ὥμοισι σάκος θέτο τετραθέλυμνον

He spoke, and Teukros put away the
bow in his shelter

and threw across his shoulders the
shield of the fourfold ox-hide (*Iliad*
15.478-9)

This author proposes that the majority of multi-layered ox-hide shields described in the *Iliad* would have been made of a similar number of layers. There is another mention of a four-layered ox-hide shield in the *Odyssey* (22.122).

Sarpedon

Another word Homer uses to describe the shape of some of his shields is *kuklos* (κύκλος), a word meaning ‘circle’ or ‘wheel’. Sarpedon’s shield is described using both κύκλος and πάντοσ’ ἔϊσιν, leaving no doubt that it is circular and lending credence to the use of πάντοσ’ ἔϊσιν to denote a circular form (see ‘Hektor’, above). Here is the description of Sarpedon’s shield:

αὐτίκα δ’ ἄσπιδά μὲν πρόσθ’ ἔσχετο πάντοσ’ ἔϊσιν
καλὴν χαλκείην ἐξήλατον, ἣν ἄρα χαλκεὺς
ἤλαισεν, ἐντοσθεν δὲ βοείας ῥάψε θαμειὰς
χρυσείης ῥάβδοισι διηνεκέσιν περὶ κύκλον

Presently he held before him the perfect
circle of his shield,
a lovely thing of beaten bronze, which
the bronze-smith hammered
out for him, and on the inward side had
stitched ox-hides in close folds
with golden rivets fastened round the
circle (*Iliad* 12.294–7)

Note that Homer describes how this shield was constructed with the layers of ox-hide being sewn (ῥάψε) together, and golden rivets (ῥάβδοισι) were used to secure either the rim or the bronze facing (it is unclear which).¹⁵ In another passage (*Iliad* 12.402), Sarpedon’s shield is described as ‘man-enclosing’ or ‘covering the whole man’ (ἀμφιβρότην) like Agamemnon’s. One could infer that this is another example of a full-height circular shield.

Aineias

This shield, too, is described using both κύκλος and πάντοσ’ ἔϊσιν (*Iliad* 20.273–280). Like the shields of Agamemnon and Sarpedon, Aineias’ shield is also described as ‘man-enclosing’; this is yet another example of a full-height circular shield. The section in the *Iliad* describing this shield contains a key passage that will be examined in detail later to

help with our reconstruction.

Periphetes

Another possible example of a full-height shield is that of Periphetes, who tripped over the rim of his shield, which ‘reached down to his feet’ (*Iliad* 15.645–6) as he turned to withdraw.

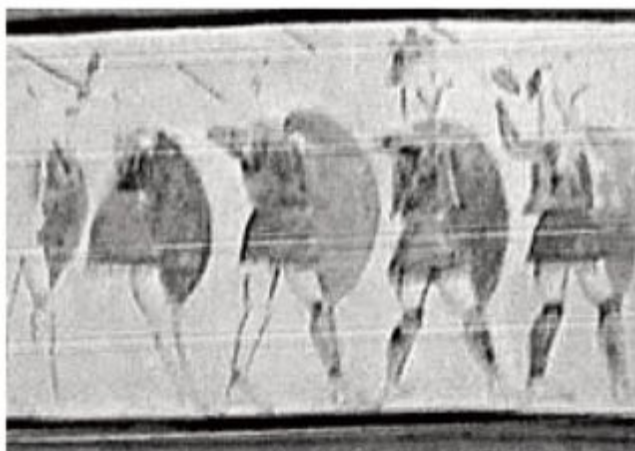


Figure 10. The ‘Warrior Stele’ found in a shaft grave at Mycenae. These warriors appear to be carrying circular or ovoid shields that reach from the neck to the shin.

Menelaos

His shield is described as circular (*Iliad* 3.347), broad (13.608), and heavy enough to resist the spears of Paris/Alexandros (3.348) and Peisandros (13.607).

From the above examples, it is abundantly clear that these shields are not ‘rounded’ or ‘ovoid’ as has sometimes been claimed. Nor was Homer using κύκλος or πάντοσ’ ἔϊσιν to describe the curved nature of the ‘figure-8’ shield. Homer’s shields are clearly and unambiguously true circles. It requires a deliberate misinterpretation of the text to claim that Homer is describing ‘tower’ shields, ‘figure-8’ shields, or

any other shield that is not circular in shape. While some of the warriors in the *Iliad* may have used non-circular shields (some may have resembled the smaller scalloped shields depicted on the 'Warrior Vase', for example; see [Figure 10](#)), Homer does not provide enough details to be certain. All of the shields for which sufficient detail has been provided are circular, including Hektor's.

A New Typology

Despite the widespread belief that Homer's heroes carried 'tower' or 'figure-8' shields as depicted in early Mycenaean illustrations, it has been demonstrated that virtually every shield described in some detail in the *Iliad* is circular. Sufficient detail is not provided in the *Iliad* to determine the shape of Aias' shield, but it is logical to assume that it, too, was circular since its construction is the same as all of Homer's circular shields (multiple layers of ox hide faced with bronze).

There seem to have been several types of shield used in the Aegean during the time of Homer. One is the full-height shield, such as the one described by Tyrtaeus, which covered 'thighs, shins, breast, and shoulders' (XI.23). Another full-height example is the oval shield depicted on the 'Dodwell pyxis' being carried on the left arm and covering neck to ankles. A second shield type is the 'Dipylon', an oval or circular shield with scallops cut from the sides. A variant of this involves a scallop cut from only one side. A third type is the circular 'Argive' shield or *aspis*, a recent development that was to soon replace all other hoplite shield types in the new era of phalanx warfare. The Argive shield (classical *aspis*) was constructed of a wooden core lined with leather, sometimes with a reinforcing plate in the middle. In the centre was an armband, and the handgrip was located out near the rim. The shield was around three feet in diameter, was deeply convex, and had no boss in the centre though some examples were faced with bronze. The reinforced rim fitted snugly over the shoulder, taking most of the weight off the arm and eliminating the need for a guige (shield strap). Peter Connolly's reconstruction weighed about 7kg.¹⁶

The shields depicted in the *Iliad*, however, are completely different from the Argive shield, the only real similarity being that they are both circular. Homer uses *aspis*, *sakos*, and

rhinos to describe his shields, and it has been shown that the terms were used interchangeably (see 'Aspis and Sakos', above). As previously mentioned, they were made of multiple layers of ox hide (*Iliad* 5.452; 6.116; 7.238-9; 12.105, 137, 425; 16.636) and faced with a thin sheet of bronze (5.437; 11.374; 13.342, 552; 14.11; 16.636, 704; 17.268). This facing could be elaborately decorated, and the edge of the shield was reinforced with a rim. This shield had a central boss and is likely to have had a central hand-grip, unlike the Argive shield.

Some of Homer's shields are portrayed as large and 'man-enclosing' implying that they were greater than those of the Classical Period. For example, the Chigi vase, dated to the seventh century, depicts shields covering neck to knee but later shields are smaller, only covering neck to thigh. In one instance, troops are portrayed placing their shields on the ground and leaning on them (*Iliad* 3.135), a feat only possible if the shield was larger than the classical three-foot shield. Unlike this *aspis*, which was carried on one shoulder, Homer's shields were carried on the back and shoulders (11.527, 544; 15.474) by means of a strap (τελαμών) (2.388-9; 12.401-2; 16.803; 17.290; 18.480). Not all shields were the same size, however. A scene is described in which those with the largest shields gave them to the best fighters so that they could form a shield wall in the front rank (14.376-7). There is an incident in which someone is stabbed in the belly underneath the shield (11.423-4). This only seems credible if the shield in question was not one of Homer's 'man covering' shields but something smaller. It seems that, when held ready, a typical shield covers from the neck (14.412) down to the thighs or knees, but some examples were larger, such as the full height ones described above.

As previously noted, Homer specifically describes Hektor's shield as being both circular and full-height, and there seems to be iconographical precedent for this typology. The possibility exists, however, that the text actually attributes two different shields to Hektor: one that is circular and another that is full height. [Figure 7](#) shows a large circular shield and, if drawn to scale, it would reach from the neck down, past the knees, to the shins. Hektor's shield would only need to be a few inches larger to touch the neck and ankles when slung on his back. Another possible depiction of large circular shields is the 'Warrior Stele' found in a grave

shaft at Mycenae (Figure 10). The illustration is incomplete but there is enough to determine that, if these warriors were carrying circular shields, they would cover from the neck to the shins. An *aryballos* recovered from Corinth and dating to the early eighth century depicts ten warriors all with full-height circular shields. The back of the 'Aristonothos krater' shows three warriors on a ship bearing what may be circular shields reaching from neck to ankles. These shields very closely resemble those described in the *Iliad*,¹⁷ though this particular illustration is very crude and may not have been drawn to scale. Homer suggests that these larger shields were intended to protect more than one person from missiles. Aias used his shield to protect Teukros as he shot his bow (*Iliad* 8.266–72), and Pandaros was protected likewise by his companions (4.112–3). The use of descriptive words such as 'broad' or 'wide' (13.552, 608; 17.132) reinforce this perception. A circular shield of the size implied in the description of Hektor's would be capable of this. Elongated shields (rectangular, 'tower', ovoid, 'figure-8') would be less able since they seem intended to wrap around an individual. The 'figure-8' shield is the least capable of protecting a person to the side of the bearer since the portion of the shield needed for this action is missing.

Some have claimed that a neck-to-ankle circular shield is impractical and would never have been used in Homeric combat, but this ignores the fact that these shields have seen use in other cultures. One type was used on Byzantine ships to protect sailors during naval engagements. Another was used by North American natives. Ephraim Pectol found three such shields in 1923 that covered from neck to just below the knee, and North American cave paintings depict circular shields that are even larger, covering neck to ankle.¹⁸ Spanish explorers describe southern Plains Indians carrying 'large buffalo hide shields to cover the entire body'.¹⁹ So it seems that this typology was a practical design for certain situations. Experiments by this author using a full-height circular shield (five-foot diameter) suggest that it is useful in formation fighting but not so practical in 'one-on-one' engagements. In fact, the method of warfare attributed to some North American tribes is very similar to that described by Homer. Shoshone Saukamaptee described one such battle in which both parties had large shields, but his own men had fewer in number because they were meant to shelter two men. He said that their bows were more powerful than his

own but still could not penetrate the hide shields. After a missile exchange, a *mêlée* sometimes followed in which there was much slaughter.²⁰

However, the above shields consisted of a single layer of rawhide (or were made from cedar bark), not the multiple hide layers described by Homer. With four layers of hide, a full-height circular shield would be very heavy. In order for a circular shield to touch the neck and ankles of a person standing around 1.75m tall, it would need to be at least 1.3m in diameter. (If Hektor stood taller than this, then his shield would have been even larger.) Assuming an average weight of four ounces per square foot of ox-hide, each circular layer would weigh around 1.9kg (area = πr^2 so the weight would be $4 \times 3.1416 \times 2.15 \times 2.15 = 58.1$ oz or 1.9kg). The amount of hide in a four-layered shield would add up to around seven and a half kilograms, and the bronze facing and additional furniture would increase the weight by an additional five kilograms taking the total weight to over twelve and a half kilograms. This is much heavier than the heaviest shields so far found in the archaeological record. There are two examples of Roman shields found at Fayum and Doncaster, reconstructions of which weigh around 10kg.²¹ These do not seem to have utilised a guige (shield strap) like Homer's shields. The guige would have taken some of the weight off the arm and enabled the shield to be a little more portable, but clearly, a shield weighing in excess of twelve and a half kilograms is much too heavy. If the Roman shields are considered to be the upper limit of a practical shield's weight, then our reconstruction must be kept under 10kg.

Hektor's Shield, Reconstructed

Taking the previously discussed interpretation of Homer's text and speculating on the approximate height of Hektor (1.75m), we get the following details: Hektor's shield is circular in shape with a diameter of approximately 1.3m; it is made of four slightly concave layers of ox-hide and faced with a layer of bronze; it has a circular bronze boss, a central horizontal hand grip, and two reinforcing rods on the underside; there is a dark rawhide rim around its edge; and a guige enables it to be slung on the back and possibly helps to take some of the weight off the arm when wielded in combat.

The problem with this description is, as has been

mentioned, the exceptional weight of the construction. It simply is not reasonable to claim that a warrior, even one of heroic strength, could have wielded a shield that weighed over twelve kilograms. A closer examination of the text will reveal a means to address this concern, though. It will be shown that it is possible to reduce the weight of a four-layered shield drastically whilst remaining consistent with Homer's text. In order to do this we need to look at Homer's description of Aineias' shield:

δεύτερος αὐτ' Ἀχιλεὺς προίει δολιχόσκιον ἔγχος
καὶ βάλεν Αἰνεῖαο κατ' ἀσπίδα πάντοσ' εἰσὶν
ἀντὺγ' ὑπο πρῶτην, ἣ λεπτότατος θέε χαλκός,
λεπτοτάτη δ' ἐπέην ὀινὸς βοός ἣ δὲ διαπρὸ
Πηλῖας ἦεν μέλι, λάχε δ' ἀσπίς ὑπ' αὐτῆς.
Αἰνεΐας δ' ἔαλε καὶ ἀπὸ ἔθεν ἀσπίδ' ἀνέσχε
δεΐσας ἐγγεῖη δ' ἄρ' ὑπὲρ νότον ἐνὶ γαίῃ
ἔστη ἱεμένη, διὰ δ' ἀμφοτέρους ἔλε κύκλους
ἀσπίδος ἀμφιβρότης ὃ δ' ἀλευάμενος δόρυ μακρὸν

After him Achilles let go his spear far
shadowing
and struck the shield of Aineias on its
perfect circle
at the utter rim where the circle of
bronze ran thinnest about it
and the ox-hide was laid thinnest there.
The Pelian ash spear
crashed clean through it there, and the
shield cried out as it went through.
Aineias shrank down and held the shield
away and above him
in fright, and the spear went over his
back and crashed its way
to the ground, and fixed there, after
tearing apart two circles
of the man-covering shield (*Iliad*
20.273-80)

From this description, the shield seems to have been constructed with layered circles of ox-hide that were not all of the same diameter. Only the facing of bronze and one layer of hide reached out to the rim of the shield. One might infer from this that the shield was constructed of concentric circles of hide with the diameter of each layer being smaller than the one below it. So, the maximum number of layers

would protect the centre, but as one moves out to the rim, there are fewer layers. This seems to be a sensible method of reducing weight while maintaining maximum protection in the centre, where the shield-bearer is most likely to get injured if the shield is compromised. Assuming that layers of four-ounce hide are used, a circle with a diameter of 1.3m would weigh 1.9kg. But the other three layers are progressively smaller. Assuming the smallest diameter is about 0.45m, the total weight of the hide would be:

Layer 1: 1.30m diameter = 1.9kg

Layer 2: 1.00m diameter = 1.25kg

Layer 3: 0.75m diameter = 0.65kg

Layer 4: 0.45m diameter = 0.2kg

Total (4 layers) = 4kg

In addition to the weight of hide, one needs to add the bronze facing and other furniture, including a hand grip, shield boss, reinforcing rods, edge rim, and the guige. In the above passage describing Aineias' shield, Homer specifies that the bronze is thinnest out near the rim, so the sheet seems to have been worked to reduce weight. There have been bronze shields found in Europe that seem too thin to be of any practical use in combat. Most scholars dismiss them as votive offerings or ceremonial shields; however the Lough Gur shield was found with a leather-like substance clinging to its back, and a Yetholm class bronze shield was also found with a leather or hide backing (though this particular shield was found with wood on its back as well), so it is possible that these 'votive' shields were actually organic shields faced with bronze, and only the metal has survived.

John Coles has suggested that the thinner bronze faces could be as light as 0.3mm,²² and this seems a reasonable thickness to work with for our full-height reconstruction.²³ The bronze facing will average 0.3mm but is heavier in the centre and lighter at the rim. The raised domes and ridges on the facing would improve its structural strength, making it a little more able to resist damage. A circle of bronze plate with 0.3mm thickness and a diameter of 1.3m weighs 3.5kg (eight percent tin bronze has a density of approximately 8,800 kg/m³; cu 8,920kg/m³; sn 7,310kg/m³). Add another

one and a half kilograms for the additional furniture, and the total weight is 9kg (4kg + 3.5kg + 1.5kg). This weight falls within the parameters set by the Roman shields mentioned above, but even more weight could be saved by using lighter hide, reducing the diameter of the inner three hide circles, and hammering the bronze facing even thinner out near the rim.

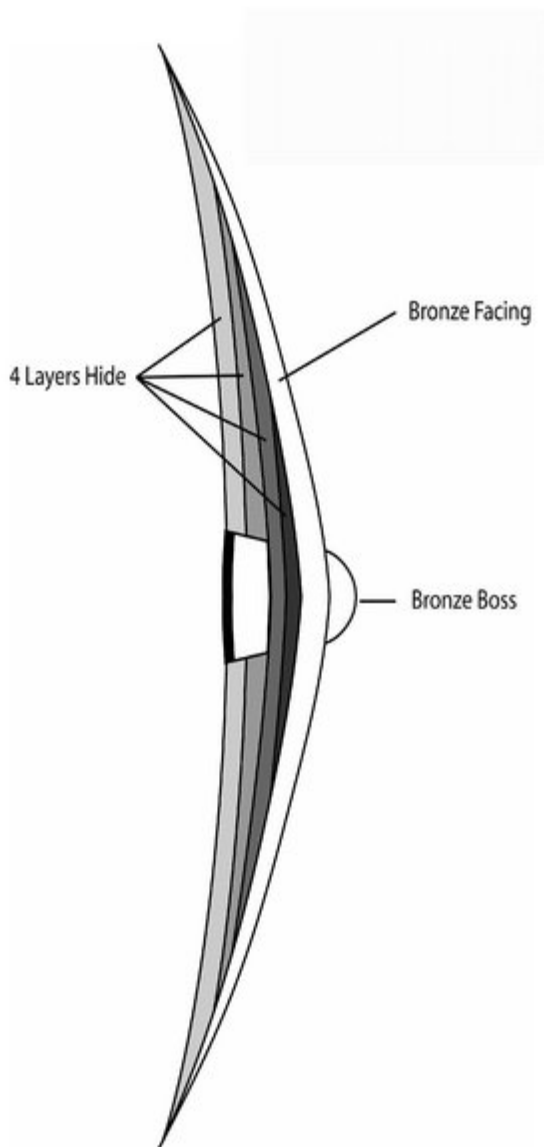


Figure 11. Author's interpretation of the composition of Hektor's shield. The cross-section has been exaggerated to emphasize the detail of the various layers.

Assembly

There are two methods that can be used to attach the layers of hide together: gluing or stitching. The Spanish *adarga* was made of multiple layers of hide sewn together with narrow strips of rawhide and there is no reason not to use the same method for constructing Hektor's shield, especially since Homer says that the ox-hide layers of Sarpedon's shield were sewn together (see 'Sarpedon', above).

There are several ways the hand grip could be attached. One method involves riveting it directly through both the hide and the bronze. In another method, used on some medieval shields, mainly to attach the guige, the back layer of hide can have slits cut into it and two loops raised, parallel to each other; a short band is then wrapped around both loops, and the hand grip would have wrapped around this 'bridge'. This method spreads out the stress of the attachment over four points.²⁴ Another is to sew a piece of tongued hide over the grip to the back of the shield like the one found at Clonbrin. According to Coles, on this shield the handgrip was 'stitched on to the back of the shield with the warrior's hand fitting into the niche left under the raised shield boss'.²⁵ The two reinforcing rods could be sewn on in the same manner, and they could be aligned similarly to those carved on the relief in [Figure 9](#). The bronze facing could be attached with rivets as described on Sarpedon's shield. Once the facing is secured, the hide rim could be added to increase the strength of the edge. Finally, the guige or shield strap is added and adjusted to fit the bearer comfortably.

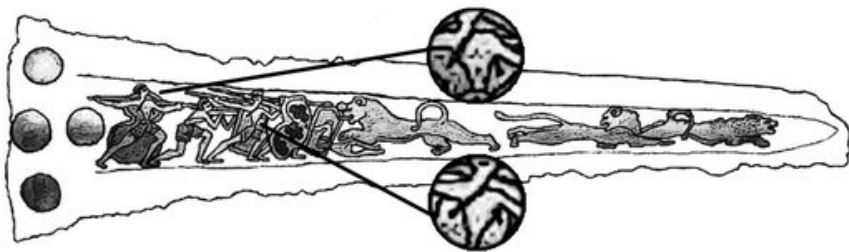


Figure 12. Part of the ‘Lion Hunt’ dagger found in Shaft Grave IV of Grave Circle A at Mycenae. The side shown depicts a lion hunting scene in which four warriors are bearing full-height shields and spears, and one warrior carries a bow. Note that the black giuges are visible on the two shields that have their backs revealed to the viewer.

The Guige

A guige or telamon (τελαμών) is a strap of leather fastened to the shield and worn over the neck and shoulder to help support its weight whilst in use. It also enables the shield to be slung over the back when not in use. To secure a 9kg shield, the guige would have to be substantial; it would need to be strong enough to support the weight and wide enough not to discomfort the bearer.

The ‘Lion Hunt’ dagger (Figure 12) shows the back of both a ‘tower’ shield and a ‘figure-8’ shield. Even though it has been proposed that these shield typologies are not depicted in the *Iliad*, the dagger can give an idea as to how the guige on a full-height shield might be fitted and carried. In this illustration both hands seem to be required to wield long spears, so the shield needs to be controlled via the guige alone. Both ends of the guige are attached to the top half of the shield, but in the *Iliad*, this does not seem to have been the case. Homer describes how Aias wore his guige in the scene where Hektor throws a spear at him:

τῇ ὅα δὴ δὴ τελαμῶνε περι στήθεσσι τετάσθην,
ἦτοι ὁ μὲν σάκεος, ὁ δὲ φασγάνου ἀργυροῖλου

but struck the two straps where they
crossed over his chest,
one for the shield and one for the silver-
studded sword (*Iliad* 14.404-5)

It seems from this that the guige is longer than those depicted on the 'Lion Hunt' dagger. For the guige to cross diagonally over the chest, the ends of it will need to be attached to opposite sides of the shield, not just on the top half as depicted on the dagger. Without making the proposed reconstruction and experimenting with the placement of the guige, it is not possible to speculate further.

There does not seem to be any archaeological evidence of buckles (metal hoops with a central tongue) dating to the period in question, so an alternative method of adjustment must be used. Some shield straps and sword belts are described as being decorated with metal and fastened with an *ocheus*. It is possible that the fastener and the decorated metal were all parts of the same device. It might involve the plate having some sort of integrated belt hook. At Mycenae, Schliemann discovered a golden belt with a clasp, and fragments of other similar clasps have been found elsewhere. It consisted of a plate with two pins that fitted into a hook riveted to the other end of the belt.

The Boss

A boss is a raised dome of metal attached to the face of a shield. On many shields an indentation or hole is needed to enable the hand to fit around the grip and a large central boss is used to protect the hand while it sits in this position. In order for a boss to fit comfortably over a clenched fist it would need a diameter of about 10cm. According to Connolly, a shield found at La Tène (250 BC) has a domed indentation approximately 10cm in diameter, and the later Roman imperial *scutum* also had a hole of around 10cm in diameter.²⁶ However, of the bosses so far found in the Aegean that date to the approximate time period in question, none is this large. The largest boss on the Kaloriziki shield has a dome with a diameter of around 6-7cm and the dome of the Kallithea boss had a diameter of 4-5cm. Neither is large enough to accommodate a closed hand so a different

method of construction is required.

One method might be to assume that there is a hollowed indentation in the shield to accommodate the hand but it does not extend all the way through the shield. For example, there might be a hole passing through two or three layers of hide but not the last one as has been illustrated in [Figure 11](#). In this sort of construction the size of the boss is irrelevant since it does not need to fit over the hand. It merely sits on top to cover the section in the centre where the hollow makes the hide thin and vulnerable.

Miscellaneous

In addition to the guige, there is something called a *termioeis* (τερμίοεις) attached to some shields. Patroklos' shield has one (*Iliad* 16.803). Lattimore translates it as 'tassels', but 'fringe' is probably a more accurate description. It is likely that this hangs from the bottom of smaller round shields and that a full-height shield, such as the one carried by Hektor, would have had no need of it. It might have been constructed in a similar manner to the *pteryges* that protected Greek thighs later in the hoplite period. It might also be similar to the curtain described by Connolly that hung from the bottom of some Argive shields to prevent hostile missiles striking the legs.²⁷ It may simply have been a decorative fringe like those shown on contemporary chitons (tunics).

Conclusion

It has been demonstrated that Homer does not use specific terms to describe different typologies of shields in his epic. He uses three different words—*aspis*, *sakos*, and *rhinos*—but they are used interchangeably with no particular reference to the size or shape of a particular shield. It has also been demonstrated that it is extremely unlikely that Aias carried a so-called 'tower' shield or that Hektor carried a 'figure-8' shield as is often suggested. If these two characters are given circular shields, as has been proposed above, then there is nowhere else in the *Iliad* that might be depicting these two typologies. Whenever Homer describes a shield in some detail, it is almost always circular. It is possible that other types of shields were being used by Homer's heroes,

but the text does not provide enough detail to confirm this. The text does indicate that different sizes of shield were used, though there is no reason why all of them could not have been circular in shape unless the proposed reconstruction of a full-height circular shield proves to be unwieldy.

Although Homer often uses the word *aspis* to describe his shields, they are not the same as the 'Argive' shield used by hoplites in the Classical period. Both shields are circular in form but have very little else in common. Homer's shield is made of multiple layers of ox-hide, not wood; it has a central hand-grip, not an armband and a grip near the rim; there are two rods reinforcing the underside; it has a guige (neck strap) to help take some of the weight off the arm; it is always faced with bronze; and, unlike the Argive shield, has a central boss.

The *Iliad* clearly describes shields that are both full-height and circular, and this typology is supported by evidence from the Aegean and elsewhere, such as North America. One should keep in mind that Homer's large shields are intended to protect not only the bearer but an adjacent companion also, so any shield that is less broad than the suggested circular design, such as the ovoid, scalloped, and 'figure-8' typologies, will be less effective at this tactic. However, a full-height circular shield made of multiple layers of ox-hide seems to be too heavy to be functional. The problem of excessive weight has been solved by analysing Homer's text in more detail, in particular the passage describing the shield of Aineias. It has been shown that a great deal of weight can be saved by using concentric circles of hide with progressively smaller diameters so that only the centre of the shield is protected by all of the layers. Further weight can be saved by varying the thickness of the bronze facing so that it is heaviest in the centre and lightest out near the rim. The subsequent reconstruction proposal produces a shield that is lighter than the heaviest extant shields in the archaeological record and may prove to be of practical use in a simulated combat situation. Further research cannot be undertaken until a prototype of the above shield is constructed, at which time the feasibility of such a design can be determined.

Should the proposed reconstruction of a full-height circular shield prove to be impractical for the method of combat described by Homer, then one must consider the theory that

the *Iliad* draws upon multiple traditions from different time periods and that Homer's heroes are depicted with two different shields: one that is full height (or 'man-enclosing') and a smaller one that is circular and constructed in the manner described above. Regarding full-height shields, it is impossible to tell whether Homer is describing the 'tower' and 'figure-8' shields of the earlier Mycenaean Period or the full-height oval shields (with or without scallops cut from the sides) that are evident in later times. As previously mentioned, it is pure speculation to suggest that Homer is specifically describing any particular full-height shield that is not circular in shape. The method of construction suggested for Hektor's shield would still be valid for smaller circular shields covering neck to knee as depicted on many illustrations both in Homer's time and in earlier periods. This circular, bronze-faced, multi-layered, hide shield seems to have been the most common type of shield carried by the warriors described in the *Iliad*.

Appendix 2

Homeric Armour

Just like Homeric shields (see ‘Appendix 1’, above), a lot of misinformation has been disseminated about the types of armour described in the *Iliad*. It has been shown by many scholars that Homer combined periods, exaggerated for dramatic effect, and is ambiguous in his description of various aspects of combat, but there is enough surviving physical evidence to conclude that his technical descriptions of various items can be considered to be fairly accurate. This section will take a fresh look at exactly what is described regarding armour in Homer’s work and determine if enough information is available to make a reconstruction.

Body Armour

Not all of Homer’s heroes wore the same armour. There is a scene in which those with the best armour give it to the best fighters (along with larger shields) so that they can fight in the front rank (*Iliad* 14.381–3). Other characters appear not to have any armour at all: Thoas was stabbed in the chest ‘where it was left bare by the shield’ (16.311–2); Elephenor is struck ‘in the the ribs that showed bare under the shield as he bent over’ (4.467–9). There are other instances of the chest being injured but it is unclear whether the weapon punched through armour or whether the victim was unarmoured. Simoeisios is speared in the breast beside the right nipple and the spearhead passed straight through to protrude from his shoulder (4.480–1), suggesting that he wasn’t wearing armour. Eniopeus, Archeptolemos, Isos, and Melanippos were likewise wounded in the chest near the nipple (8.120–1, 312–3; 11.108; 15.576–7).

Another example of the chest being wounded is when Thoas stabs Peiros above the nipple and the weapon

penetrated his lung:

τὸν δὲ Θόας Αἰτωλὸς ἐπεσσύμενον βάλε δουρὶ
στέρνον ὑπὲρ μαστοῖο, πάγῃ δ' ἐν πνεύμονι χαλκίῳς
ἀγχίμολον δὲ οἱ ἤλθε Θόας, ἐκ δ' ὄβριμον ἔγχος
ἐσπασατο στέρνοιο, ἐρύσασατο δὲ ξίφος ὀξύ,
τῷ ὁ γε γαστέρα τύψε μέσην, ἐκ δ' αἶνυτο θυμόν.

τεύχεα δ' οὐκ ἀπέδυσε περίστησαν γὰρ ἑταῖροι
Θρηῖκες ἀκρόκομοι δολίχ' ἔγχεα χερσὶν ἔχοντες

Thoas the Aitolian hit Peiros as he ran
backward
with the spear in the chest above the
nipple, and the bronze point fixed
in the lung, and Thoas standing close
dragged out the heavy
spear from his chest, and drawing his
sharp sword struck him
in the middle of the belly, and so took
the life from him,
yet his equipment they did not strip off,
for his companions stood about him,
Thracians with hair grown at the top,
gripping their long spears (*Iliad*
4.527-33)

This passage has a couple of interesting points. Firstly, Homer uses the term *teuchos*, which means ‘implements’ or ‘equipment’, rather than *thorax*, which specifically means ‘armour’. The term was commonly used to refer to the entire panoply of war, which would include body armour. In the *Iliad* the word is used 161 times, and most of the time it is referring to the entire panoply including weapons, shield, and armour. It seems unlikely that *teuchos* would have been used if the character had a helmet and shield but not body armour and, based on this, it seems likely that Peiros was wearing a cuirass and that the spear punched through it.

Secondly, we are told that Peiros was finished with a sword blow in the stomach. While it is sometimes possible to punch through thin bronze plate with a strong spear thrust, it is all but impossible to compromise any kind of metal armour with a single-handed sword (see ‘Defensive Capability of Bronze

Age Armour', p. 84). Assuming that the author is describing a realistic encounter, the conclusion must be that there was no armour worn over the stomach in this instance. This will be discussed in more detail later (see 'Abdomen Protection', p. 124).

There is one instance where Homer seems to suggest that armour was pierced by a spear:

Ἰδομενεὺς δ' αὐτοῖο τιτύσκετο δοῦρι φαιινῷ,
καὶ βάλεν ὕψι βιβάντα τυγῶν οὐδ' ἤρκεσε θώρηξ
χάλκεος, ὃν φορέεσκε, μέση δ' ἐν γαστέρι πῆξε.

Idomeneus aimed at him with the
shining spear, and threw it,
and hit him as he came onward with
high stride, and the cuirass
of bronze he wore could not withstand
it, the spear fixed in the middle of the
belly (*Iliad* 13.370-2)

But it is also possible that the armour couldn't stop the spear because it didn't cover the belly at all. Most metal cuirasses don't cover the stomach; a separate plate is required for this area. (For more detail, see 'Abdomen Protection', p. 00.)

Linen

The *Iliad* describes three characters, the lesser Aias, Adrestos, and Amphios, wearing armour made from linen (*Iliad* 2.528-9; 2.830). Apart from Strabo's *Geography* (13.1.11), these are the only occurrences of the word *linothorax* (λινωθώραξ) anywhere in the entire corpus of Greek texts (see 'Textiles', p. 68 for more details on linen armour).

Leather

Although there is plenty of evidence for hide armour during the Bronze Age (see 'Leather', p. 69), there is not a single mention of it in the *Iliad*. There are a few mentions of leather helmets, which will be discussed later (see 'Homeric

Helmets', pp. 130-133). Lattimore's translation has a reference to 'ox-hide armour' in book twelve (12.22) but the term is better translated as 'ox-hide shields'.

... ὅθι πολλὰ βοάγρια καὶ τρυφάλεια
κάπτεσον ἐν κονίῃσι καὶ ἡμῶν γένος ἀνδρῶν

... where many ox-hide shields and
helmets

had fallen in the mud, and many of the
race of the demi-god mortals (*Iliad*
12.22-3)

The same phrase is used in the *Odyssey* in a passage that also refers to shields, not armour:

νόῃν δ' οἴοισιν δύο φάσγανα καὶ δύο δοῦρε
καλλιπείειν καὶ δοιὰ βοάγρια χερσὶν ἐλέσθαι

But for us two only, leave behind two
swords and two spears
and two ox-hide shields to pick up with
our hands (*Odyssey* 16.295-6)

Bronze

By far the most common material from which Homer's armour is made is bronze. Not only are there numerous references to the Greeks (Achaeans) and Trojans (Danaans) wearing bronze,¹ but specific contingents from particular regions are also described in bronze.² Only a very few are singled out for not being equipped as the others. The Lokrians, for example, are portrayed as being more lightly armoured than the other Achaeans. They were skirmishers unsuited to close combat, being equipped with slings and bows (*Iliad* 13.714-7).

Homeric bronze armour could be elaborately decorated (3.358; 6.504; 8.195; 12.396; 14.420). Agamemnon's armour

was very elaborately decorated:

τοῦ δ' ἦτοι δέκα οἶμοι ἔσαν μέλανος κυάνοιο,
δώδεκα δὲ χρυσοῖο καὶ εἴκοσι κασσιτέραιο
κυάνεοι δὲ δρακόντες ὀφωρέχματο ποτὶ δειρὴν
τρεις ἐκάτερθ' ἴκισιν ἐοικότες, ὥς τε Κρονίων
ἐν νέφει στήριξε, τέρας μερόπων ἀνθρώπων.

Now there were ten dark bands of
cobalt upon it,
and twelve of gold and twenty of tin.
And toward the opening
at the throat there were rearing up
serpents of cobalt,
three on either side, like rainbows,
which the son of Kronos
has marked upon the clouds, to be a
portent to mortals. (*Iliad* 11.25-8)

Rhesos' gear is described as follows:

τεύχεα δὲ χρύσεια πελώρια θαῦμα ἰδέσθαι
ἦλυθ' ἔχων τὰ μὲν οὐ τι καταθνητοῖσιν ἔοικεν
ἀνδρεσσιν φορέειν, ἀλλ' ἀθανάτοισι θεοῖσιν.

his panoply is golden and gigantic, a
wonder to look on,
that he brought here with him. It is not
like that for mortal
men to carry, but for the immortal gods.
(*Iliad* 10.439-41)

Glaukos had a cuirass also apparently made of gold but
exchanged it for the bronze one owned by Diomedes:

ἐνθ' αὐτὲ Γλαῦκῳ Κρονίδης φρένας ἐξέλετο Ζεὺς,
ὥς πρὸς Τυδείδην Διομήδεα τεῖχε' ἄμειβε
χρύσεια χαλκείων, ἐκατόμβοι' ἐννεαβόων.

but Zeus the son of Kronos stole away
the wits of Glaukos

who exchanged with Diomedes the son
of Tydeus armour

of gold for bronze, for nine oxen's worth
the worth of a hundred. (*Iliad*
6.234-6)

It is possible that the above two armours were only gilt-edged rather than being made of solid gold. Homer describes many items decorated in precious metal and evidence of metal plating (i.e. tinning) has been discovered on some Bronze Age helmets.³ The above passage also mentions the cost of this armour. Glaukos' golden cuirass was worth more than ten times that of Diomedes: one hundred oxen compared to nine. Even nine oxen were an expensive proposition. It can be seen why only the wealthy could afford to outfit themselves in this gear.

The armour of Menelaos is described in the most detail and the relevant passages will be analysed below (see 'Abdomen Protection', pp. 124-128).

A few attempts have been made to reconstruct the armour that Achilles wore but there is nowhere near enough information in the *Iliad* to make more than a guess. We know that it was made of bronze (22.233) and was well-fitted (19.384-5). When Hektor had stripped the armour from Patroklos and wore it in the final battle with Achilles we learn a little more about it:

εἰσορόων χρῶα καλόν, ὅπῃ εἴξειε μάλιστα
τοῦ δὲ καὶ ἄλλο τόσοι μὲν ἔχε χρῶα χάλκεα τεύχη
καλά, τὰ Πατρόκλοιο βίην ἐνάφιξε κατακτάς
φαίνετο δ' ἢ κληίδες ἀπ' ὤμων αὐχέν' ἔχουσι
λαυκανίης, ἵνα τε ψυχῆς ὤκιστος ὀλεθρος
τῇ δ' ἐπὶ οἱ μεμαῶν' ἔλασ' ἔργει δῖος Ἀχιλλεύς,
ἀντιχρὺ δ' ἀπαλοῖο δι' αὐχένος ἦλυθ' ἀκωκή.

He was eyeing Hektor's splendid body,
to see where it might be most likely
to give way, but all the rest of his body
was held in the armour,

brazen and beautiful, which he stripped
when he cut down the strength of
Patroklos;

yet it revealed where the collar-bones

hold the neck from the shoulders,
the throat, where death of the soul
comes most swiftly;
in this place divine Achilles drove the
spear as he came on in fury,
and clean through the soft part of the
neck the spearpoint went. (*Iliad*
22.231-7)

So it is shown that Achilles' panoply did not include neck armour. If pauldrons covered the shoulders then they would have been fairly small since Dendra-sized pauldrons cover most of the collarbones. His helmet (see below, p. 00) and shield (see 'Homeric Shields', p. 102 and p. 132) are described in more detail.

Dendra Armour

The panoply found at Dendra has been described in some detail above (see 'The Dendra Panoply', pp. 77-80). It has sometimes been assumed that Homer's characters would have worn this type of armour, but it will be shown that this is not the case.

The Dendra armour had pieces covering the torso, thighs, neck, shoulders, forearms, and shins. As noted previously, this armour was designed for an era in which archers were the primary threat. The Dendra armour was probably worn by a charioteer who needed comprehensive coverage to compensate for the lack of a shield. By the time of the alleged Trojan war, combat had changed (see 'Transitional Period', p. 10). The elite were no longer chariot archers but infantry fighters bearing shield and spear and sword. Homer makes no mention of neck, shoulder, or forearm armour. The use of a shield and the greater need for manouverability when fighting on foot caused these additional pieces to be discarded. The abdomen is protected by a single plate (*mitre*) rather than a fault of multiple segments (see 'Abdomen Protection', pp. 124-128). There is only a single passage that could perhaps describe a Dendra-style cuirass:

ἐγγύθεν ὀρημβεῖς πυκνὸς δέ οἱ ἦρκεσε θώρηξ
τόν δ' ἔφορει γυάλοιον ἀρηρότα· τὸν ποτε Φυλεὺς
ἦγαγεν ἐξ Ἐφύρης, ποταμοῦ ἅπο Σέλληεντος
Ξεῖνος γάρ οἱ ἔδωκεν ἀναξ ἀνδρῶν Εὐφίτης
ἐς πόλεμον φορέειν δῆϊον ἀνδρῶν Ἀλευαρίην
ὅς οἱ καὶ τότε παῖδος ἀπὸ χροῶς ἦρκετο' ὀλεθρον.

but the cuirass he wore protected him,
solid
and bearing fitted, concave plates,
which, in days past, Phyleus
had taken home from Ephyra and the
river Selleëis.

A guest and friend had given him it, lord
of men, Euphetes,
to carry into the fighting and beat off
the attack of the enemy,
and now it guarded the body of his son
from destruction. (*Iliad* 15.528–34)

The armour in this passage has been singled out by Homer to distinguish it from the others. He notes its provenance and suggests that it comes from an earlier generation. This one is made with 'concave plates' (γυάλοιον), which could possibly be describing the segmented plates on the Dendra armour that cover the stomach and thighs. In addition to the Dendra example, there were similar, but narrower, plates found at Thebes which were dated a little later than the Dendra find (see pp. 75–77 for more detail of the Thebes armour). There is no more detail given on this armour so there is no way to know whether Phyleides had a regular cuirass with a segmented extension, or whether it was made entirely of segmented plates, and there is also no way to tell whether he wore other pieces such as forearm and shoulder guards.

Arm Armour

We know that the hands were unprotected (*Iliad* 13.782, 17.601) and Homer makes no mention of arm guards, but there is one passage that possibly implies such protection.

Τεύκρος δὲ Γλαύκῳ κρατερὸν παῖδ' Ἴππολόχοιο
ἰφ' ἐπασσόμενον βάλε τείχεος ὑψηλοῖο,
ἧ δ' ἴδε γυμνωθέντα βραχίονα, παῖσε δὲ χάριμης.

And Teukros with an arrow struck
Glaukos, the strong son of Hippolochos,
as he was swarming aloft the wall's high
bastion,

where he saw the uncovered arm, and
ceased his eagerness for combat.

(*Iliad*

12.387-9)

One possible interpretation is that part of the arm was armoured and Teukros aimed for a part of the arm that was not so covered.

Shoulder Armour

As noted there are no arm guards mentioned in the *Iliad*, nor are there any neck guards, but there are two possible mentions of a shoulder guard. Closer analysis of the text, however, reveals that this interpretation is unlikely:

καὶ βάλ' ἐπάσσοντα τυχὼν κατὰ δεξιὸν ὦμον
θώρηκος γυάλον διὰ δ' ἔπιπαιτο πικρὸς οἷστός

and shot, and hit him as he charged
forward, in the right shoulder

between the cuirass hollow; and the
sharp arrow flew straight through (*Iliad*
5.98-9)

ἦδη γάρ οἱ ἐφῆρα βέλος καὶ μιν βάλλον ὦμον
δεξιὸν ἀντικρὺ διὰ θώρηκος γυάλοιο

For I have shot my arrow and hit his
shoulder,
the right one, straight through, in the
cuirass hollow (*Iliad* 5.188-9)

The word διὰ literally means 'between' but it can also be interpreted as 'through'. We can say that the ball went 'through' the trees when we really mean 'between' the trees.

In the above context the arrow could have gone ‘between’ the armour, rather than through it; the arrow may have passed through a gap between the cuirass and shoulder guard, which seems unlikely since there is considerable overlap. The word *gualon* (γυάλον) means ‘hollow’ or ‘concavity’. *Thorax gualon* has been misinterpreted as ‘shoulder guard’ but the *Iliad* uses the same phrase five times and only the above two passages involve the shoulder. It is more likely that the phrase means, just as it says, a concave part of the armour, perhaps a chased or fluted section. The most likely interpretation of the above two passages is that the arrow passed through a thin section of the cuirass at the shoulder, and not a separate shoulder guard. None of the other three passages using the same phrase (*thorax gualon*), as already noted, involves the shoulder.

Ἰδομενεὺς δ' ἄρα Οἰνόμαον βάλε γαστέρα μέσσην
 ῥήξε δὲ θώρηκος γυάλον, διὰ δ' ἔντερα χαλκός
 ἦφυσ' ὃ δ' ἐν κονίησι πεσὼν ἔλε γαῖαν ἀγοστόν.

But Idomeneus hit Oinomaos in the
 middle of the belly
 and broke the cuirass hollow, so that his
 entrails came through the bronze,
 and he fell to the ground clawing the
 dust with his hands. (*Iliad* 13.506–9)

Πριαμίδης μὲν ἔπειτα κατὰ στήθος βάλεν ἰφ
 θώρηκος γυάλον, ἀπὸ δ' ἔπτατο πικρὸς οἰστός.

The son of Priam hit him then on the
 breast with an arrow
 in the cuirass hollow, but the sharp
 arrow flew back. (*Iliad* 13.586–7)

Αἴας δ' αὖ Φόρκυνα δαΐφρονα Φαίνοπος υἱὸν
 Ἰπποθόῳ περιβάντα μέσση κατὰ γαστέρα τύψε
 ῥήξε δὲ θώρηκος γυάλον, διὰ δ' ἔντερα χαλκός
 ἦφυσ' ὃ δ' ἐν κονίησι πεσὼν ἔλε γαῖαν ἀγοστόν

But Aias in turn cut at Phorkys, the wise
 son of Phainops,
 in the middle of the belly as he stood
 over fallen Hippothoös,

and broke the cuirass hollow, so that his entrails came through the bronze, and he fell to the ground clawing the dust with his hands. (*Iliad* 17.312-5)

If one also considers that Homer specifically states that the neck and collar bones were vulnerable (22.324-5) in addition to over a dozen references to Homeric fighters stabbing and even cutting at the shoulder,⁴ then one must conclude that there were few, if any, warriors still wearing shoulder guards by the time of the alleged Trojan War.

Abdomen Protection

A solid metal cuirass usually stops at around navel level. If it extended any further, it would hinder the wearer bending at the waist. This means that the armour does not protect the stomach and groin. This is borne out by the many characters who are wounded in this area including Leukos (*Iliad* 4.491-3), Diore (4.525-6), Amphios (5.616), Antilochos (13.568), and Asteropaios (21.180). There are also several instances of characters getting stabbed in the back, through the liver, including Apisaon (11.578), Hypsenor (13.412), and Tros (20.469). Ares and Patroklos are hit in the *keneon*, which can mean either the 'belly' or the 'small of the back' (5.857; 16.821).

The *Iliad* describes two different characters wearing something called a *mitre*, which appears to be hanging below the cuirass to protect the abdomen. This plate probably hung loosely so as not to inhibit flexibility at the waist, but left a small gap between the two plates that a weapon point may exploit.

First, Diomedes (assisted by Athena) hits Ares through the *mitre* into his belly with a spear:

δεύτερος αὐτ' ὤρητο βοὴν ἀγαθὸς Διομήδης
ἔρχε' χαλκείῳ ἐπέρισε δὲ Παλλὰς Ἀθήνη
νεῖατον ἐς κενεῶνα ὅθι ζωννύσκετο μίτρη
τῇ ὅα μιν οὐτα τυγόν, διὰ δὲ χροῖα καλὸν ἔδειπεν,
ἐκ δὲ δόρυ σπῆσεν αὐτίς.

After him Diomedes of the great war cry

drove forward
with the bronze spear; and Pallas
Athene, leaning in on it,
drove it into the belly where the *mitre*
girt him.
Picking this place she stabbed and
driving it deep in the fair flesh,
wrenched the spear out again. (*Iliad*
5.855-9)

Homer also describes an arrow hitting Menelaos in the gap
between the cuirass and the *mitre*:

αὐτὴ δ' αὖτ' ἴθυνεν ὀθι ζωστήρος ὀχῆς
χρύσειοι σύνεχον καὶ διπλούς ἦντετο θώρηξ.
ἐν δ' ἔπεσε ζωστήρι ἀρηρότι παρὸς οἰστός
διὰ μὲν ἄρ' ζωστήρος ἐλήλατο δαιδαλέοιο,
καὶ διὰ θώρηκος πολυδαυδάλου ἡγήρειστο
μίτρης θ', ἣν ἐφόρει ἔρυμα χρὸς ἔρκος ἀκόντων,
ἣ οἱ πλείστον ἔρυτο διαπρὸ δὲ εἰόατο καὶ τῆς.
ἀκρότατον δ' ἄρ' οἰστός ἐπέγρυνε χρὸα φωτός
αὐτίκα δ' ἔρρεεν αἶμα κελαινεφές ἐξ ὠτειλῆς.

steering the arrow's course straight to
where the
golden *zoster* was fastened and his
thorax overlapped.
The sharp arrow was driven against the
join
and passed clean through the *zoster*
cunningly wrought;
into the elaborately crafted *thorax* the
shaft was driven
and the *mitre* which he wore to protect
his body and keep the spears off,
which guarded him best, yet the arrow
went even through this also
and with the very tip of its point it
grazed the man's skin
and straightway from the cut there
gushed a cloud of dark blood. (*Iliad*
4.132-40)

Later, Menelaos reassures his comrades that the arrow
wound is not mortal:

οὐκ ἐν καιρίῳ ὀξὺ πάγη βέλος, ἀλλὰ πάροιθεν
εἰρύσατο ζωστήρ τε παναίολος ἠδ' ὑπένεργε
ζώμα τε καὶ μίτρη, τὴν χαλκήρες κάμον ἄνδρες.

The sharp arrow is not stuck in a mortal
place, but the shining
zoster turned it aside from its course,
and the *zoma* beneath it
with my *mitre* that bronze-smiths
wrought carefully for me (*Iliad* 4.185–7)

The armour is mentioned a third time when Machaon tends
to Menelaos' arrow wound:

αὐτίκα δ' ἐκ ζωστήρος ἀρηρότος εἴλκεν οἷσόν
τοῦ δ' ἐξελκομένοιο πάλιν ἄγην ὀξέες ὄγκοι.
λύσε δέ οἱ ζωστήρα παναίολον ἠδ' ὑπένεργε
ζώμα τε καὶ μίτρη, τὴν χαλκήρες κάμον ἄνδρες.
αὐτὰρ ἐπεὶ ἶδεν ἔλκος ὀθ' ἔμπεσε πικρὸς οἰστός,
αἶμ' ἐκμυζήσας ἐπ' ἄρ' ἦπα φάρμακα εἰδώς

straightway he pulled the arrow forth
from the joining of the *zoster*,
and as it was pulled out the sharp barbs
were broken backwards.
He unfastened the *zoster* then and the
zoma beneath it
with the *mitre* that bronze-smiths
wrought carefully for him.
But when he saw the wound where the
bitter arrow was driven,
he sucked the blood and skilfully laid
healing medicines on it (*Iliad* 4.213–8)

The above passages are difficult to interpret. Menelaos is
wearing a *thorax*, *zoster*, *mitre*, and *zoma*. The *thorax* is
easily translated as 'cuirass'. The *zoster* is usually translated
as 'war belt'; it goes over the top of the other items and
probably holds weapon scabbards (for more detail, see
'Belts', below). Autenrieth's dictionary defines these terms as
follows:⁵

Mitrē: a *band* or *girdle* round the waist and abdomen, below the *statòs thōrēx*, the exterior of metal plates, the interior lined with wool, shorter than the *zōma*, which covered it, while over both and the *thōrēx* passed the *zōstēr*.

If Autenrieth is correct then the abdomen is covered by three distinct items: the *mitre* is covered by the *zoma*, which is covered by the *zoster*. Homer's description would make more sense if the first two items were reversed, so that the bronze *mitre* was worn over the non-metallic *zoma*. The term *zoma* is ambiguous and could be a piece of armour or an item of clothing. No other clothing is mentioned covering the wounded part of the body when Machaon tends the wound so, in this instance, it is possible that the *zoma* is an article of clothing. It is also possible that they are two segmented plates and one hangs underneath the other, similar to the Dendra construction, one covering the stomach and the other covering the groin. One occurrence of *zoma* not yet mentioned, however, is during a boxing match, when it is worn along with some hide straps called *himantas*:

ζώμα δέ οἱ πρότον παρακάββαλεν, αὐτὰρ ἔπειτα
δόκεν ἱμάντας εὐμήτους βοῶς ἀργαῖόλοιο.

The *zoma* was first pulled on about his waist, and then

he was given the *himantas* carefully cut from the hide of a ranging ox. (*Iliad* 23.684-5)

The word *zoma* is also used once in the *Odyssey* where the speaker laments having followed his comrades with only his *zoma* and shield.

αὐτὰρ ἐγὼ χλαῖναν μὲν ἰὼν ἐτάροισιν ἔλειπον
ἀφραδέως, ἐπεὶ οὐκ ἐφάμην ὀγκωσέμεν ἔμπηξ,
ἀλλ' ἐπόμεν σάκος οἷον ἔχων καὶ ζώμα φαιερόν.

But I'd left my cloak behind when I

came with my comrades,
in carelessness, since I did not think I'd
be cold in any case,
but I followed bearing only my shield
and splendid *zoma*. (*Odyssey* 14.480-2)

Later he tells Odysseus that he fears dying from the cold
because he left behind his cloak and only came with his
tunic:

... οὐ τοι ἔτι ζῶοισι μετέσσομαι, ἀλλὰ με χεῖμα
δάμναται οὐ γάρ ἔχω χλαῖναν παρά μ' ἤπαφε δαίμων
οἰοχίτων' ἔμηναι νῦν δ' οὐκέτι φρυγὰ πέλονται.

... surely I'll no longer be among the
living, since the winter weather
tames me, for I don't have a cloak. A
divinity tricked me

to be dressed only in a tunic. Now
there's no longer a way out. (*Odyssey*
14.487-9)

So at the very least he had a shield, a tunic, and his *zoma*.
Since the *zoma* is mentioned along with the shield it is
possible that it is an item of defense. If it was an article of
clothing one might assume that it would be mentioned with
the tunic, rather than the shield. But the fact that it was
worn during a boxing match suggests that it is not a metallic
piece of armour. Based on all of the above, the most likely
definition of the *zoma*, in this context, is some sort of padded
girdle, which can be worn by itself or underneath the bronze
mitre.

Finally, in the *Iliad*, Achilles spears Polydorus in the middle
of the back:

τὸν βάλε μέσσον ἄκοντι ποδάρκῃς διὸς Ἀχιλλεύς
νότα παραίσοοντος, ὅθι ζωστήρος ὄχηες
χρύσειοι συνέχον καὶ διπλὸς ἦν τετο θώρηξ
ἀντικρὺ δὲ διέσχε παρ' ὀμφαλὸν ἐργχεὺς αἰχμῇ

For as he passed by swift-footed brilliant
Achilleus hit him

with a spear thrown in the middle of the
back where the
golden war belt was fastened and his
cuirass overlapped.

The spearhead held its way straight on
and came out by the navel (*Iliad*
20.413-6)

It seems from the above that the halves of the cuirass were joined at the back rather than at the sides, but the above analysis of Menelaos' armour might suggest that Polydorus was wearing a *mitre* and that Achilles' spear hit where these two plates came together, since the two phrases are identical for both armours.⁶

Greaves

From the many thigh and buttock injuries it is clear that the upper legs were unarmoured.⁷ Though the thighs are unprotected, shin greaves (*knemis*) are common, especially among the Achaeans.⁸ Most are bronze and held in place with lacing around the calf. It is unclear whether they cover the knee.

Achilles' greaves are made of tin (*Iliad* 18.613; 21.592) and the metal is not merely decorative, since the plate is strong enough to resist a spear thrown by Hektor:



Figure 13. Several frescos at Pylos dated to c. 1300 BC show what appears to be a rounded plate, similar to the greaves found at Kallithea, laced to a larger greave, perhaps made of linen. Only the right shin has the plate protection.

ἦ ῥα, καὶ ὁξύν ἄκοντα βαρείης χειρὸς ἀφῆκε.
καὶ ὅ' ἔβρισε κνήμην ὑπὸ γούνατος οὐδ' ἀφάμαρτεν
ἀμφὶ δὲ μιν κνήμης νεοστεύκτου κασιπεύροιο
σημεδαιλέον κονάβησε πάλιν δ' ἀπὸ χαλκῶς ὄρουσε

He spoke, and threw the sharp spear
from his heavy hand
and struck him in the shin below the
knee, it did not entirely
miss him, but the newly-wrought greave
of tin
resounded terribly, and back the bronze
[spear] rebounded (*Iliad* 21.590–3)

The greaves of Paris, Agamemnon, Patroklos, and Achilles
have silver fastenings. The same phrase is used four times:

κνήμῃδας μὲν πρῶτα περὶ κνήμῃσιν ἔθηκε
καλὰς, ἀργυρέοισιν ἐπισφυρίοις ἀραρυίας

First he placed around his shins fine

greaves with

silver fastenings to hold them at the ankles (*Iliad* 3.330-1; 11.17-18; 16.132-3; 19.369-70)

One translation has the silver item being a separate ankle-guard, which is unlikely given the structure of the sentence. Far more likely is that the greaves are like those found at Kallithea with metal rings and wire running along the edge. This wire was used to attach lacing. Similar greaves have been found in central Europe including Bosnia and Hungary. It seems probable that Homer was describing these rings and even the wire being made of silver, rather than a distinct ankle guard.

There are several frescos at Pylos showing what appears to be a Kallithea-type greave laced over a larger linen greave. The metal covers only the shin while the linen wraps around the entire lower leg and reaches up to cover the knee (see [Figure 13](#)). Only the right shin is covered in each illustration.

Padding

While tunics are sometimes described being worn under Homeric armour, there is no mention of a separate padded undergarment. This is no surprise since extant examples of bronze plate suggest that the armour incorporated its own padded liner (see the chapter on 'Armour', p. 65). The only type of padding mentioned in the *Iliad* is the *zoma*, which was discussed above (see 'Abdomen Protection', pp. 124-128).

Belts

There are three belts mentioned in the *Iliad*: the *zoster*, the *aortēr*, and the *telamon*. The *zoster* seems to be a type of girdle made of leather and decorated in precious metals. It wraps around the waist and covers the gap between cuirass (*thorax*) and belly plate (*mitre*). Weapons were either hung on this belt or over the shoulder. In one passage Menelaos tells his brother that his *zoster* stopped an arrow from seriously wounding him (*Iliad* 4.185-7, quoted under

‘Abdomen Protection’, p. 126). Aias stabs Amphios in the belly beneath the *zoster* (5.615–6) suggesting that this belt provided some protection for fighters who did not have a *mitre*, but did not provide much coverage.

The *aortēr* is only mentioned once in the *Iliad* (11.31), but four times in the *Odyssey* (11.609; 13.609; 17.198; 18.109). It is a weapon belt for carrying a sword (*aor*) that is worn over the chest like a baldric.

A more common term for *aortēr* is *telamon*. This is a general word used for any belt worn over the shoulder. It usually carried a weapon or a shield and is mentioned twelve times in the text.⁹ We are told that when one is unarmoured, the *telemon* can cause discomfort to sweaty skin (*Iliad* 2.388; 5.796). It also seems to have been fairly heavy because Sarpedon’s *telemon* protected him from Teukros’ arrow (12.401) and Aias’ protected him from Hektor’s spear:

Αἴαντος δὲ πρότερος ἀκόντισε φαίδιμος Ἴκτωρ
ἔγχει, ἐπεὶ τέτραπτο πρὸς ἰθὺ οἱ, οὐδ’ ἀφάμαρτε,
τῇ ὅα δύο τελαμώνε περὶ στήθεσσι τετάσθην,
ἦτοι ὁ μὲν σάκεος, ὃ δὲ φαογάνου ἀργυροῦλου

First glorious Hektor made a cast with
his spear at Aias
since he had turned straight against
him, nor missed with his throw
but struck, there where the two
telemons were laid tight across his
chest,
one for the shield and one for sword
with the silver nails (*Iliad* 14.402–5)

All three belts could be dyed in colours such as red (6.219) or purple (7.305), and decorated with precious metal (4.132; 11.31, 38; 18.480, 598; 20.414).

Homeric Helmets

Helmets are made of bronze, with wide cheek guards giving them a ‘hollow-eyed’ appearance (*Iliad* 5.182; 11.353; 13.529–30; 16.794). They are close fitting on the brows and temples (13.189; 18.610) and many have horns attached in

front of a horsehair crest,¹⁰ which is mounted on a high peak (6.470; 11.351). One crest was purple (15.538) and another was golden in colour (22.315). Most helmets have two horns (3.362, 369, 372; 4.459; 5.744; 6.9; 11.41; 13.614; 16.338) but some have four (5.743; 11.41; 12.384; 16.794; 22.314).

Homer's helmets reach down to the neck (*Iliad* 7.712),¹¹ but leave the jaw under the ear vulnerable (13.178, 671; 16.405, 606; 17.617). It is unclear whether the ear itself was exposed, but Achilles is described attacking Moullos so that his spear passed through one ear and out of the other (20.472–74).¹² In front, the eyes (14.493–4), mouth (16.345), chin (13.388), and throat (13.542; 17.47; 22.324–7) were unprotected, but the cheeks were covered by cheek guards (16.106; 17.294; 20.397). The helmet was held in place by means of a leather strap under the chin (3.371–5).

Lattimore describes some helmets as four-layered or four-ply (5.743; 11.41; 12.384), suggesting multiple layers of assembly. However the actual word that is used is τετράφαλον. *Tetra* means 'four' and *phalos* means 'horn' or 'crest', so these are probably more examples of helmets with four horns. However, there is a description of a three-layered helmet in the passage where Hektor's helmet protects him from a spear cast:

ἦ ῥα, καὶ ἀμπεπαλὼν προΐει δολιχόσκιον ἔγχος
καὶ βάλεν, οὐδ' ἀφάμαρτε τιτυσκόμενος κεφαλῆφιν,
ἀκρὴν καὶ κόρυθα: πλάγχθη δ' ἀπὸ χαλκῶφι χαλκός,
οὐδ' ἔκετο χροῖα καλόν: ἐρύκακε γάρ τρυφάλεια
τρίπτυχος αὐλώπης, τὴν οἱ πόρε Φοῖβος Ἀπόλλων.

So he spoke, and balanced the spear far-shadowed, and threw it aiming at the head, and struck against his mark, nor missed it, at the high peak of the helm, but the bronze from the bronze was driven back, nor reached his shining skin, the helmet guarded it, three-ply and hollow-eyed, which Phoibos Apollo gave him. (*Iliad* 11.349–53)

The word τρίπτυχος means 'three-layered' or 'three-fold'.

The helmet might have been made of three layers, or it may be that the additional layers refer to a padded liner and perhaps a separate cap that was worn under the bronze helmet.

Athena's helmet is described as being made of gold with a double-crest and four horns:

κροτὶ δ' ἐπ' ἀμφίφαλον κυνήην θέτο τετραφάλῃον
χρυσείην, ἑκατὸν πολέων πρυλλέουσ' ἀραρυΐαν.

Upon her head she set the double-
crested golden helm with its four horns
wrought with the fighting men of a
hundred cities. (*Iliad* 5.743-4)

The helmet that Hephaistos made for Achilles is described twice:

τεύξε δέ οἱ κόρυθα βριαρὴν κροτάφοις ἀραρυΐαν
κάλῃν δαιδαλέην, ἐπὶ δὲ χρύσειον λόφον ἤραε

and wrought him a helmet, massive and
fitting close to his temples,
a lovely and intricate work, and laid a
golden crest along it' (*Iliad* 18.611-2)

ἀγχιού, πρόσθεν δὲ σάκος στέρνοιο κάλυψε
καλὸν δαιδάλεον, κόρυθι δ' ἐπένευε φαινήν
τετραφάλῃ: καλὰ δὲ περισοείοντο ἔθειρα
χρύσεια, ἃς Ἥφαιστος ἱεὶ λόφον ἀμφὶ θαμνείας.

In front of his chest the beautiful
elaborate great shield
covered him, and with the glittering
helm with four horns
he nodded; the lovely golden horsehair
was shaken all around

which Hephaistos had driven frequently
on both sides of the ridge. (*Iliad*
22.313-6)

The words λόφον ('crest') and θαμειάς ('frequent') are ambiguous. The author has translated the last line so that the horsehair was fixed at many points on both sides along the ridge of the helmet, rather than a single thick plume fixed to a single point at the top of the helmet. θαμειάς can also mean 'thick', but the horsehair was fixed on 'both sides' of the ridge, suggesting the former construction.

The type of helmet that most closely fits Homer's descriptions is a sub-type of the Illyrian but with a high peak and wider cheekguards, which are curved around the eyes to give a 'hollow-eyed' appearance. Illustrations of this type of helmet have been found at Pylos (gold pendant), and on Crete at Hagia Triada (rhyton) and Zakro (seal fragment).

Other helmets in the *Iliad* are described as having been made of hide, either bull's hide (*Iliad* 10.258), ox-hide (12.22) or marten's hide (10.335, 458), and Homer specifies that they had 'neither horn, nor crest' (10.258). There is only one mention of a boars-tusk helmet:

... ἀμφὶ δὲ οἱ κυνέην κεφαλῆφιν ἔθηκε
ῥινοῦ ποιητὴν πολέειν δ' ἔντοσθεν ἱμάειν
ἐντέτατο στερεῶς· ἔκτοσθε δὲ λευκοὶ ὀδόντες
ἀργυρόδοντος ὕψος θαμέες ἔχον ἔνθα καὶ ἔνθα
εὐ καὶ ἐποσταμένως· μέσση δ' ἐνὶ πύλῳ ἀρήρει.

... and he too put over his head a helmet
made of hide; and inside were many
leather straps
tightly stretched, and on the outside the
bright teeth
of a white-toothed boar were closely
attached one after another
with craftsmanship and skill; and in the
middle a felt lining was fitted. (*Iliad*
10.261-5)

Homer then goes on to describe the provenance of the helmet, apparently making an effort to demonstrate that it was not a common item at the time of the Trojan War but a curiosity handed down from an earlier era (*Iliad* 10.266-70).

Conclusion

Based on the descriptions in the *Iliad*, one can get a fairly clear picture of the type of armour worn by Homer's heroes. Armour was predominantly made of bronze and consisted of a *thorax* for the torso, a bronze *mitra* and padded *zoma* covering the stomach and groin, and greaves for the shins. A tunic was worn underneath but there is no mention of a padded undergarment. Extant examples of bronze plate suggest that an integrated padded liner was used instead. There is no neck or forearm armour and the apparent mention of shoulder pauldrons is dubious. Three characters are described wearing linen armour and there is no mention of leather armour at all.

Most helmets were also made of bronze but some were made of hide and there is a single description of a boars-tusk helmet. The bronze helmets covered much of the face, having wide cheek guards that curved around the eyes giving a 'hollow-eyed' appearance. They were decorated with crests of horsehair on top and multiple horns on the brow.

Appendix 3

Warriors of the Bronze Age

Through careful analysis of archaeological artefacts, literature, depictions, and carvings, one can get an idea of how the fighters from various Bronze Age cultures equipped themselves. The various items outlined in this section are described in more detail in the previous chapters. Hopefully this section will give the reader a general idea of the appearance of warriors from the following cultures.

Mari Warrior

Evidence from Mari dating to the Early Bronze Age show men wearing helmets held in place by a chin strap. The only armour would have been a helmet made of copper or, perhaps, leather or rawhide. They are mainly conical in shape and protect the ears and back of the head. Some headgear is beret-shaped rather than conical. Most warriors wear knee or ankle-length kilts probably made of goat fleece or woven wool with fringed hems. A wide sash is draped over the right shoulder and extends down to the knees at both the front and back. This sash is decorated with two rows of evenly spaced circles. Some have speculated that these circles imply bezanted leather armour,¹ but they are far more likely to depict animal skin (e.g. leopard) or some sort of heraldic device. The earliest Mari shield is depicted on a shell plaque showing two Mari warriors standing over a fallen enemy. One carries a long spear wielded underhanded and a man-height reed shield. The shield appears to be bound in four distinct bundles and curves backwards at the top. The shield-bearer is protecting an archer who is releasing an arrow up over the shield.

Chariots were not in use this early. Illustrations show a four-wheeled wagon or 'war cart' pulled by onagers. The cart

carries two men: a driver and a warrior wielding multiple javelins.

Sumerian Warrior

Most of the evidence showing how these warriors were armed comes from the Cemetery of Ur, the Standard of Ur, and the Stele of Vultures. The earliest illustrations indicate that the most common Mesopotamian weapons were maces, daggers, spears, javelins, and throwing sticks. In graves from the First Dynasty of Ur daggers, spears and axes were found but no arrows. On the Stele of Vultures soldiers are clean shaven with shoulder-length hair. They wear sheep-skin kilts with the fleece left intact and a cloak of some kind that covers one shoulder. They all wear conical helmets similar in shape to those found in the royal tombs of Ur. The officer class would be wearing copper-alloy helmets but those of the common troops could have been leather. Shields are full-height and rectangular in shape. They have a central boss and are likely to have been carried by means of a shoulder strap because both hands are needed to wield the long two-handed spear. Some troops are depicted with only cloaks and helmets, and no shields at all. Military vehicles are similar to those of the Mari: four-wheeled war carts pulled by onagers, not horses.

Hurrian/Canaanite Warrior

The Arraphians of Nuzi were part of the Hurrian Empire. Hurrian warriors are depicted on the 'state chariot' found in the tomb of Thutmose IV, along with Canaanite warriors. From this illustration along with evidence from Nuzi, a reasonably accurate picture can be drawn of a typical Hurrian warrior's appearance. Hair is either close-cropped or worn collar-length behind the ears with a headband. All men have beards and none of the infantry is depicted wearing a helmet (though many helmets appear scattered on the ground). Foot soldiers are bare chested but some wear small, circular pectorals or medallions hanging from the neck, providing some limited protection. Holding up the skirt is a wide strap going over one shoulder and passing diagonally over the body. Sometimes two straps are evident, going over both shoulders and crossing in the centre of the chest. Skirts

are either knee or ankle length and are likely to have been made of textiles; the linear designs on the skirts imply a woven garment, probably from wool. None of the infantry appears to be wearing footwear. Four figures are holding daggers or short swords which they all hold in an overhand stabbing position, rather than thrusting underhand. Two men are holding axes but no thrusting spears are shown. Other illustrations show that these warriors carried at least two different weapons, either a missile weapon and a *mêlée* weapon or two *mêlée* weapons. They include bows, javelins, slings, throwing sticks, short swords, and axes of both cutting and piercing types. The combination of axe and javelin(s) is common. Some Canaanite archers have shoulder-slung quivers on their backs.

Charioteers are more heavily armed. Drivers wear scale helmets (*gurpisu*) crested with feathers or streamers. Armour consists of a corselet (*sariam*) of leather and/or metal scales (*kursimtu*) with the neck protected by a gorget of bronze or possibly hide. Sleeves are either scaled and elbow-length or full-length, possibly made of flexible leather, but not always covered by scales. The *sariam* not only covers the torso, but often extends down into a knee-length scale-covered skirt (*dutiwa*). Fallen charioteers are depicted wearing shoes and some also seem to have leggings under their skirts. The chariot archers are less well-protected. Their armour is less often reinforced with scales and they do not wear a gorget protecting the neck. They carry triangular bows in the left hand and small rectangular shields are slung over the left shoulder.

Egyptian Warrior

Predynastic Egyptian illustrations dating to the early fourth millennium depict fighters wearing ostrich feather headdresses, and loin cloths with the tails of bulls and other animals as belts. Weapons include spears, axes, and maces. Most men carry a bundle on their shoulders. The most famous example is the 'Hunters Palette' but another example is a vase found in Abydos Tomb U-239. On this four warriors are depicted in the above clothing despatching prisoners with maces. This indicates that these tribal clans not only engaged in hunting but warfare also. Weapons include short bows, lassos, spears/javelins, throwing sticks, maces, and

axes. A scene dating to the late fourth millennium, depicted on a knife handle found at Gebal el-Araq, shows nine warriors engaging in combat. They wear loincloths and have different hairstyles, some long and some shaved, perhaps representing two different tribes. Weapons include knives and maces. Illustrations dating to the third millennium depict soldiers wearing a kilt, with an animal skin jacket and a shield, but no helmets. Weapons include short bows, maces, axes, spears, daggers, javelins, and fighting sticks. Most weapons were still made of stone but those owned by the elite were copper-alloy.

Soldiers in the Old Kingdom (last half of the third millennium) are still dressed similarly to those above, in loincloths, tailed kilts, and a belt. Sometimes animal skins are worn across one shoulder. The main weapons are the mace, bow, dagger, and broad cutting axe. Axes are depicted being wielded in one hand and two.

In the Middle Kingdom there are two types of foot-soldier. Archers (*iry-pdt*) are depicted with a bow (sometimes two bows) and occasionally a hand weapon. All Middle Kingdom bows are self bows; the composite bow doesn't appear in Egypt until the New Kingdom. Few have quivers. Most archers are shown with a bundle of arrows held in the hand or stacked on the ground. The bow is drawn with one or two fingers and the thumb; this allows a couple of arrows to be held in the other fingers. It seems that archers make up about a third of the troop contingent in a fighting force. Mêlée troops (*mnfy*) are depicted with a spear, javelin, axe, and parrying shield or a hide-covered shield (some have both). Some troops have no shield and wield their axe in two hands. Occasionally a soldier will use a two-handed spear. Most men wear nothing but a red or white kilt and headband. Many are barefoot, though some wear sandals. Some archers are depicted with two shoulder straps that cross at the chest or are connected to a belt. Many troops are likely to still be using stone weapons.

Egyptian foot soldiers had not changed much by the time of the New Kingdom. The elite, armed with bows and scale armour, were now fighting from chariots, but the infantry were still wearing little more than a kilt, though some now wear pleated linen tunics (*kalasiris*). Axes were more likely to be piercing types and the khopesh was sometimes replacing the cutting axe. Self bows are longer and more powerful and

composite bows are now being used. Most spears are short, one-handed types. Bronze weapons were ubiquitous and iron was starting to be used.

Hittite Warrior

An illustration of a Hittite warrior-god from the jamb of the King's Gate at Hattusa shows him bare-chested with a belted kilt and helmet. He is armed with an axe and a short sword. Other illustrations show Hittite soldiers wearing thigh-length tunics that were belted at the waist. Helmets have cheek and neck guards and a long plume. Long hair is worn in a thick plait. Bare thighs but shins are protected by greaves. Scale armour has been found at Hattusa but it was probably only worn by chariot archers. Boots, probably made of leather, have upturned toes.

Mycenaean Warrior

The earliest illustrations show Mycenaean warriors wearing short tunics and fighting with bows and long, two-handed spears. Shields are full height of various shapes and are worn slung around the neck. The only protection is a boars-tusk helmet.

By the middle of the second millennium, chariot warriors wore either a long corselet made of leather or bronze scales, like their neighbours further east, or a suit of plate like the Dendra panoply. Helmets were starting to be made from bronze with elaborate crests and cheek guards. Other illustrated helmets have been called 'feather' helmets and 'hedgehog' helmets, but there is no way to know how they were constructed. Chariot weaponry included composite bows, javelins, spears, and swords.

By the time of the 'Transitional Period' plate armour had been modified to make it more suitable for fighting on foot. Smaller pieces were used to allow for more articulation and less of the body was covered.

Homeric Warrior

The Trojan War is alleged to have occurred at the end of the

Bronze Age during the 'Transitional Period' that was discussed in the first chapter. The following is an interpretation of the weapons and armour described in the *Iliad*.

Homeric Weapons

Most of Homer's heroes wield spears, javelins, and swords. Some shoot a bow like Paris and Pandaros. The Lokrians have slings and bows. Rocks are thrown about the battlefield and sometimes cause severe injuries.

Homeric Helmets

Helmets are made of bronze, with a nasal and wide cheek guards giving them a 'hollow-eyed' appearance. They have horns attached in front of a horsehair crest, which is mounted on the helmet's high peak. At least one crest was coloured purple. Most helmets have two horns, but both of Achilles' helmets have four horns. Helmets are close fitting on the brows and temples, and made of multiple layers or plies, usually four, but a three-ply helmet is also mentioned. The use of multiple sheets could have one of two meanings: either the helmet consisted of multiple layers, perhaps the bronze helmet had a leather liner and a padded cap was worn underneath; or that the helmets were assembled in several segments.² Homer's helmets reach down to the neck, but leave the jaw under the ear vulnerable. It is unclear whether the ear itself is exposed, but Achilles is described attacking Moullos so that his spear passes through one ear and out the other. In front, the eyes, mouth, chin, and throat were unprotected, but the cheeks were covered by cheek guards. The helmet is held in place by means of a leather strap under the chin. Even the helmet of Athena is described in a similar fashion, the major difference being that the god's helmet was made of gold instead of bronze. Other helmets are described as being made of leather, either bull's hide, ox-hide or marten's hide, and Homer specifies that they were uncrested. There is only one mention of a boars-tusk helmet, and Homer then goes on to describe its provenance and seems to have made an effort to demonstrate that it was not a common item at the time of the Trojan War, but a curiosity handed down from an earlier era.

Homeric Shields

Shields are invariably circular, made of multiple layers of ox-hide with a bronze facing. They vary from medium-sized to full height, with a central hand grip and bronze boss, a strap to sling it over the shoulder, and a hide or bronze rim. There is no mention of 'figure-8' or 'tower' shields. (For a detailed analysis, see Appendix 1, 'Homeric Shields'.)

Homeric Armour

Not all of Homer's heroes wore the same armour. Some had better armour than others. Ox-hide armour is mentioned in a context which implies that it was worn by lower ranking troops; armour made from linen is also mentioned. Greaves are common, especially among the Achaeans. Most are bronze but Achilles' greaves are made of tin.

Not only are there numerous references to the Achaeans and Trojans (Danaans) wearing bronze, but specific contingents from particular regions are also described in bronze. Only a very few are singled out for not being equipped as the others. The Lokrians, for example, are portrayed as not being as heavily armoured as the other Achaeans; they were skirmishers unsuited to close combat, being equipped with slings and bows.

Homeric bronze armour could be elaborately decorated; examples include Rhesos' 'golden and gigantic' armour, Glaukos' golden cuirass, and Agamemnon's elaborately decorated armour. The description of Menelaus' corselet sounds like the armour was made of two halves, but it joined at the front and not the sides like most cuirasses; it is possible that he was wearing scale armour that wrapped around and closed at the front. (For a detailed analysis, see Appendix 2, 'Homeric Armour'.)

Miscellaneous Homeric Equipment

Some sword scabbards were worn on a belt over the shoulder and the hilt was up high near the armpit (*Iliad* 22.306-7). The shield was also carried on a shoulder strap

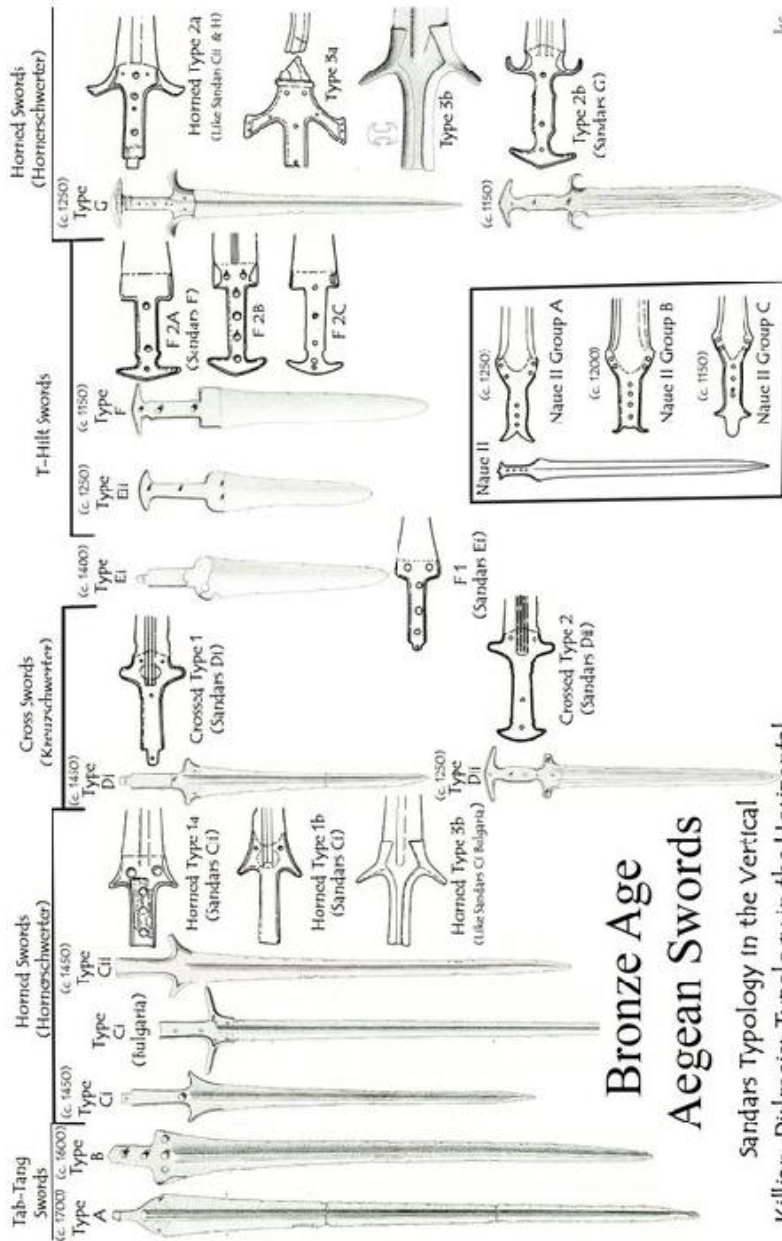
and the two straps crossed in the middle of the chest (*Iliad* 14.405).

A war belt was worn around the waist and buckled in front (*Iliad* 5.857; 11.234; 12.189; 17.578). One was red in colour (6.219). Some wore their swords on the war belt, hanging along the thigh (16.473; 20.173). A knife was worn next to the sword (3.272; 19.252-3). There was a flap or plate hanging under the war belt protecting the stomach (4.187, 215-6). Feet were protected by sandals (10.132).

Appendix 4

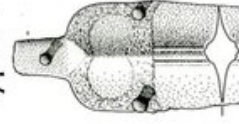
Typology of Bronze Age Swords

The diagrams on the following pages were drawn by Kirk Lee Spencer. They combine the typological system formulated by Nancy Sandars in 1961 (and amended by Jan Driessen and Colin McDonald in 1984) with that of Imma Kilian-Dirlmeier, published in 1993.



Type A

Date: c.1700
Ancestry
Mesopotamian daggers migrate west to the Levant c. 1900 B.C.

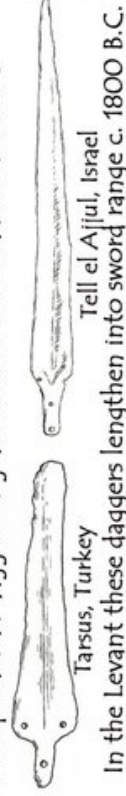


Tang:

Flat Narrow
Short 1 rivet
or Long
2 or 3 rivets

Shoulders:
Rounded
Unflanged

Blade:
Up To a Meter
In Length
High Midrib with
Rhomboid Section
Sometimes Round



Tarsus, Turkey

Tell el Ajjul, Israel

In the Levant these daggers lengthen into sword range c. 1800 B.C.



Byblos, Lebanon Length 57cm.

Cretian traders or adventurers passing through Levant carry this form back to Aegean where it grows in quality and length c. 1700 B.C.



Arkalochori, Crete L. 111cm

Or Type A simply developed from local Aegean daggers growing into sword length weapons



Platanos Crete, "tholos" B



Malla, Crete L. 74cm

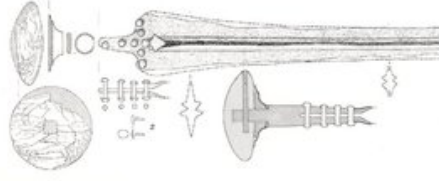


Malla, Crete



Thoben, Greece L. 88cm

Staphylos, Greece L. 32cm



Agina Burial, Greece L. 79cm

Note: Finely decorated hilts of gold and ivory, lack of rivets, long length and pristine condition of some finds has lead to the suggestion that these swords may have been votive offerings or ceremonial weapons never meant for war.

Type B

Date: c.1600

Apocryphal



Tang:
Broad Long
Several Rivets
Sometimes
Flanged

Shoulders:

Flanged
Square or
Slightly
Pointed

Blade:

Shorter

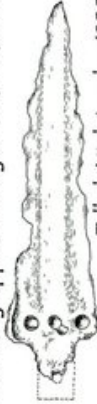
Stouter

Than Type A

Rather Broad

Lower Midrib

The earliest hint of squared flanged shoulders appears on daggers found at Tell el Ajjul in Israel. As this form migrated northward the tang appears longer and wider. c. 1850 B.C.

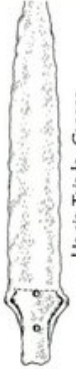


Tell el Ajjul, Israel. c.1900 B.C.

In Syria the flanges on the shoulders become more pronounced and even appears on the tang. c. 1750



Atchana, Syria



Hagia Triada, Greece

Once the form enters the Aegean it again develops a midrib probably taken from indigenous Type A forms. However, the blade length, while longer, stays about half that of the Type A forms. c. 1650



Hagia Triada, Crete L.33cm

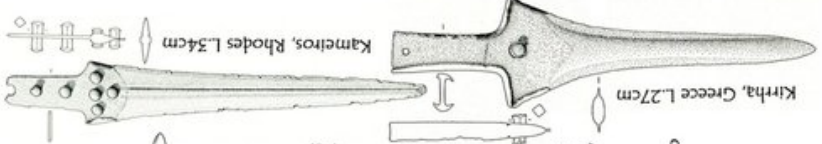
Note: Type B did not obtain the length or fine decoration of Type A. It was of a design that was less specialized and more serviceable. Because of this and the supposed overlap with Type A, Type B might be thought of as a transitional form into the horned swords. For the defining characteristic of Type B swords, namely flanges on shoulders spreading to the tang, is an important trend for the future of Aegean swords as well as those in the East. Flanged swords would later be popular in parts of Europe & the British Isles, however, there, as yet, has been no connection found with the earlier Aegean forms.



Mycenae, Greece Shaft Grave VI



Mycenae, Greece Shaft Grave VI



Kirrha, Greece L.27cm

Kamellos, Rhodes L.34cm

Type Ci

Date: c.1450

Horned 1b

Ancestry



Tang:
Broad Long
Several Rivets
Flanged
Usual pommel
tang with rivet

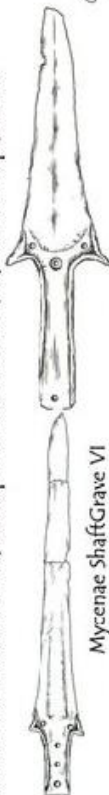
Shoulders:
Fanged
Horned
Projections
Horn Flange
Not
Hammered
Over

Rivets:
2 in shoulders
1-3 in tang

Blade:

Long slender High Decorative Midrib Well Balanced

Type Ci developed as a continuation of the trends of the Type B swords. This is especially clear in the Type B finds in the shaft graves at Mycenaean both in terms of the development of horns and the rivet pattern.



Mycenaean Shaft Grave VI

By 1450 B.C. the Type Ci were being manufactured in the Aegean with the length and very fine decoration of the earlier Type A forms. In a sense the horns are simply the organic hilts of the Type A cast as part of the blade to better protect the hand from the opponents blade. This feature reaches its maximum extent in type Ci swords found in Bulgaria.



Ialysos, Rhodes L.101cm



Varibop, Albania L.84cm

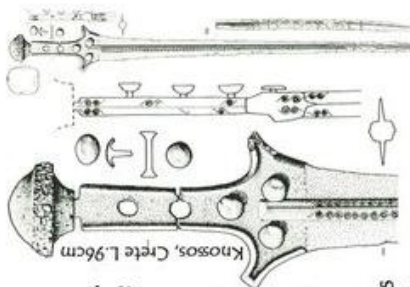


Perustica, Bulgaria L.76cm

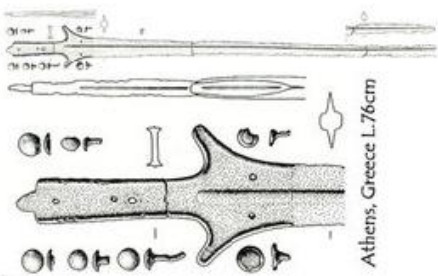
Note: Type Ci has a wide distribution to Israel in the east and north far into Eastern Europe (which show heavier use, unlike the prestige pieces of the Aegean).



Knossos, Crete L.82cm



Knossos, Crete L.96cm



Athens, Greece L.76cm

Type Di Date: c.1450

Ancestry

Type Di is similar and contemporary with the Type C swords. Generally earlier Type Di swords tend to have a more angular outline to the shoulders. These angular forms are not as long lived. This trend could mark a branch from Type C to Type D swords.



Tang: Broad, Long & Flanged
Common

Pommel: Tang
Shoulders: Flanged
Rounded Lobes
Giving Cross

Appearance: Rivets: 2 rivets in Shoulders
In Tang: 0 or 1 Rivet or 3 Large Rivets

Blade: Length 60-70cm
Well Marked Midrib
May Have Spiral Decoration

Unprovenanced
Garmenj, Albania L.100cm

Unprovenanced
Ialyssos, Rhodes L.42cm

Another possibility is that the rounded lobe shoulders of Type Di existed in earlier forms in daggers, either in Mycenaean or in Gournies and lengthened into the sword range.

Swords of Type Di are fairly uniform, however, there are very fine decorated forms, many with gold-plating over wood much like the earlier Type A forms. This association recalls the belief that these masterpiece swords were made more for show.



Knossos, Crete L.47cm

Hagios Ioannis, Greece L.62

Knossos, Crete L.47cm

Hagios Silas, Greece L.51

Knossos, Crete L.61cm

Knossos, Crete L.56cm

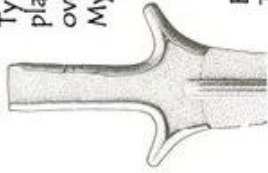
Type Cii

Date: c.1450

Ancestry

Horned 1a

Type Cii seems to be a development of Type Ci to better hold the grip plates to the grip. This may be why rivets are rare. The flanges are bent over the wood plates to hold securely. This technique appears earlier in Mycenaean ShaftGrave and Levant finds.

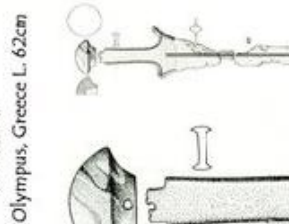
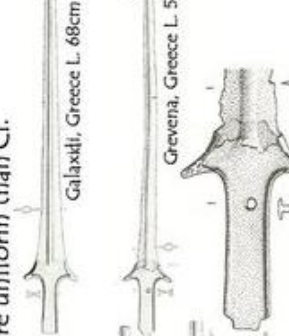


Mycenaean ShaftGrave VI

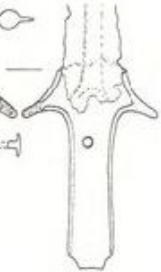
By 1400 B.C. the Type Cii were being manufactured in the Aegean. They were by far simpler and more uniform than Ci.

- Tang: Broad Long
- Flanged
- Rare pommel
- tang No rivets
- Shoulders: Flanged
- Horned
- Projections
- Horn Flange
- Hammered
- Over

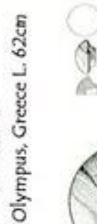
- Kiritha, Greece L. 66cm
- Knossos, Crete L. 65cm
- L. 76cm
- Komsi, Greece L. 68cm



- Rivets: None in Grip
- Blade: Moderate Length
- Lower Midrib



Ialysos, Rhodes L. 75cm



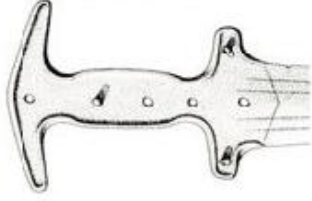
Olympus, Greece L. 62cm

Type Dii Cross-Hilt 2

Date: c.1250

Ancestry

Type Dii is essentially a continuation of Di that lost the midrib and gained a T-shaped flanged pommel extension. Flanged pommels are as old as the Hyksos dynasties and were used in Egypt and Palestine from about the 17th century. In Syria and Palestine they remained popular and are found frequently at Ras Shamra, from the 16th century. These early flanged pommel forms generally belong to knives and daggers and only occasionally come on sword-length weapons (also true of Type Dii forms). The shape of the flanged pommel extension is less sharply expanded in the Levantine than in the Aegean, a semicircle rather than a "T" and they are usually without any grip rivets. As with earlier forms, this feature seems to have diffused into the Aegean from the Levantine East. The ribbed and grooved blade is probably also Levantine.



Tang:
Broad, Long
& Flanged

Shoulders:
Flanged
Rounded Lobes
Giving Cross
Appearance

Blade:

Length 52-60cm. Only 2 found long enough to be swords. Others are dagger length.

Flattish blade with no midrib, but grooves down the center or very fine ribs outlined by fine grooves

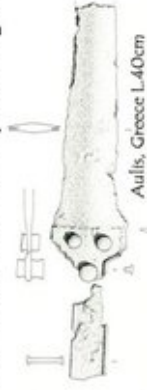
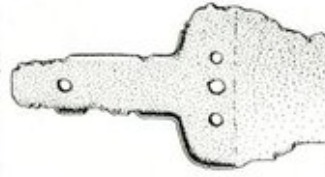


The short sword/dagger size possibly signified easily carried as a self-defense weapon. Rather than a war sword.

Type Ei Date: c.1400

Ancestry

Type Ei stem from the same round-shouldered dagger as the cruciform or Killian F1 swords, however, they never grew to sword length. Longest only 40cm.



Aulis, Greece L.40cm



Agedlia, Greece L.24cm



Knossos, Crete L.36cm



Olympia, Greece

Tang:

Flanged grip
sometimes with
unflanged
pommel tang
extension.

Flattened into a knife like blade with a decidedly U-shaped point.

Shoulders:

Flanged Rounded

Blade:

Short, broad
and almost flat

In some finds, ferocious whetting of the edges has sharpened the profile, and increases the suitability of the label "carvers".
In all probability they were general purpose knives.

Type Eii

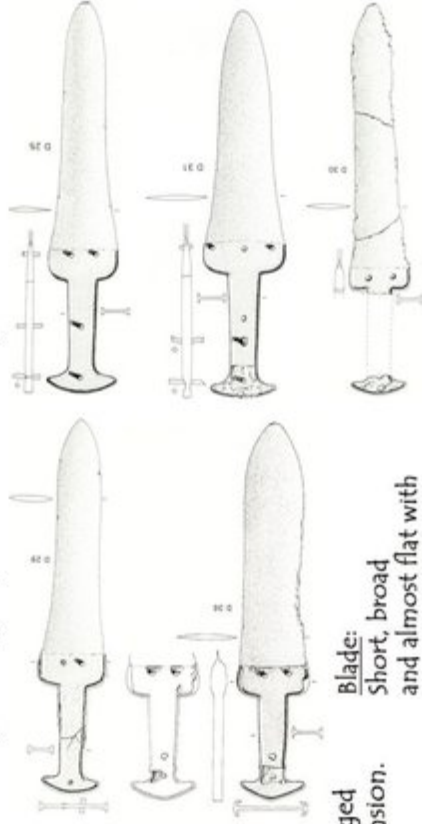


Tang:
Flanged grip
ending in
T-shaped flanged
pommel extension.

Shoulders:
Flanged Rounded

Date: c.1250

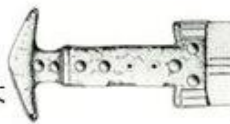
Type Eii is essentially Ei with the addition of a T-flanged pommel with a slight increase in the angularity of the blade profile. A very small group with uniform lengths between 30-40cm.



Blade:
Short, broad
and almost flat with
broad rounded tip

Type F

Date: c.1150



Type F is a larger group and new tendency with diverse forms which may have arisen in the mix of migrating people groups after the destruction event of the early 12th century. This type has been found in Sicily and even one fragment as far away as Cornwall.

F2a



Table:

Deeper Flanged grip
ending in
T-shaped flanged
pomel extension.

963



Shoulders:

Flanged Squared
Angular

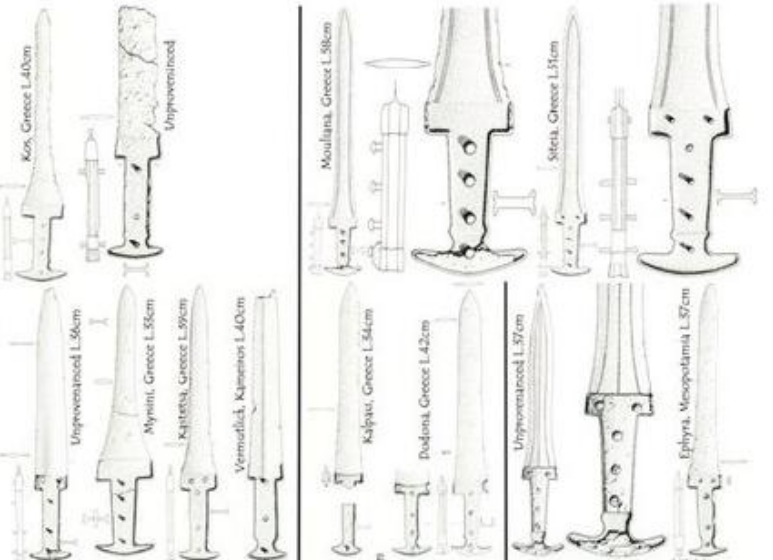
Rivers:

Two groups: One with 2 horizontal rivets and broader bladed. The other with 1 central rivet and narrower bladed

 $\overline{F2c}$ 

Blade:

Short, broad
and almost flat in F2a
Becoming less broad, more
pointed and thicker to F2c.



Type G

Date: c.1250 – 1150

Ante-type 2



In terms of design, it seems plausible that Type G swords develop as the flanges on the horned shoulders of Type C swords grew deeper and were bent together to form the more solid looking horns of the Type G class.

Sandar's Type H

Rivetless flanged grip which narrows to a rodlike extension of rectangular section.

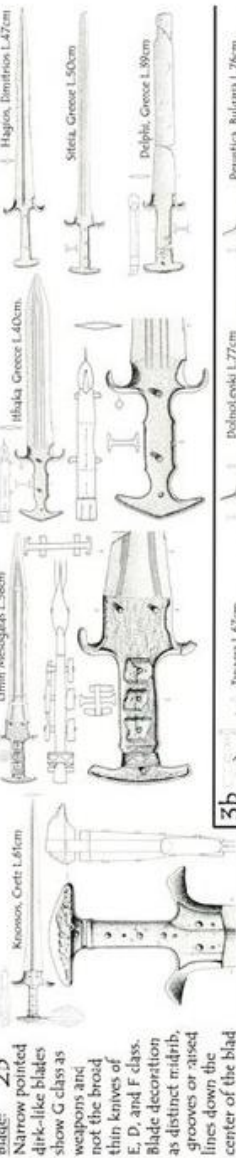
Marriage of Oriental blade with Aegean horned shoulders. Pommel spur extension may have made its way north to appear on Hallstatt A swords.

2a Tangi: Flanged grip with dominant forms ending with T-flanged pommel



2b

Blade: Narrow pointed dirk-like blades show G class as weapons and not the broad thin knives of E, D, and F class. Blade decoration as distinct midrib, grooves or raised lines down the center of the blade



3a

Shoulder hooked horns



3b



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46

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47

This depends upon the length of the bow. The long compound bow of the Bronze Age prevented shooting over the horse's head or rump, thus reducing the arc of fire. It was not until the advent of the shorter recurve bow that this problem was redressed.

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It was not until the stirrup was invented that this problem was rectified, enabling the rider to stand in the saddle and keep his movement independent of his mount.

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J.M. Coles, 'European Bronze Age Shields', *Proceedings of the Prehistoric Society* Vol. 28 (1962), pp. 156-190.

15

P.H. Blyth, *The effectiveness of Greek armour against arrows in the Persian War (490-479 B.C.): an interdisciplinary enquiry* (Ph.D. thesis, University of Reading, 1977), p. 194.

16

Molloy, *op. cit.* (note 1), pp. 1057-1060.

17

E. Godehardt, J. Jaworski, P. Pieper & H.M. Schellenberg, 'The reconstruction of Scythian bows', in B. Molloy (ed.), *The Cutting Edge: Studies in Ancient and Medieval Combat* (Stroud: Tempus, 2007), pp. 112-133.

18

Godehardt *et al.*, *op. cit.*, p. 129.

Appendix 1

1

R. Lattimore (trans.), *The Iliad of Homer* (Chicago: University of Chicago Press, 1961).

2

Hoplōn (ὅπλον) means 'tool' or 'implement'. The term can refer to the 'tools of war', including arms, armour, and shield; i.e. the entire panoply, not just the shield.

3

J. Chadwick, *The Mycenaean World* (Cambridge: Cambridge University Press, 1976), pp. 163–64.

4

In this instance, Lattimore uses the word 'shield' to translate *sakos* and 'buckler' to translate *aspis*. The word 'buckler' suggests a small shield or at least implies a shield that is smaller than the *sakos*. It has been shown that Homer does not use *aspis* to describe shields that are smaller than the *sakos*. Therefore, it is not a correct interpretation to use 'buckler' as a translation for *aspis*.

5

Aspis is used to describe the shields of Odysseus (11.434, 435, 457), Menelaus (3.347, 349; 17.7, 43, 45), Elephenor (4.468), Diomedes (5.4, 182, 281, 437, 797; 23.818), Aineias (5.297, 300; 20.162, 274, 277, 278, 281, 323), Deïkoön (5.537), Paris/Alexandros (6.322), Nestor (8.192; 10.76; 14.11), Agamemnon (11.32), Koön (11.259), Agastrophos (11.374), Chersidamas (11.424), Sarpedon (12.294, 402, 404; 23.799), Deïphobos (13.163, 258), Idomeneus (13.405, 409), Aphareus (13.543), Peisandros (13.611), Thoas (16.312), Pronoös (16.400), Patroklos (16.704, 803), Aretos (17.517), Agenor (21.581), and Hektor (3.356, 357; 6.118; 7.250, 251, 260, 270, 272; 11.61; 13.157, 160, 192, 803; 14.419; 16.360; 22.97, 111).

6

Sakos is used to describe the shields of Odysseus (10.149, 257), Thrasymedes (14.9), Antilokos (13.418, 552, 565), Atreides (13.646), Teukros (15.479), Phyleides (15.528), Aiakides (16.136), Peleïdes (22.290, 291), Achilles (18.478, 481, 608; 18.609; 19.373, 379; 20.261, 268, 289; 21.164, 165, 241; 22.313), and Aias (3.335; 5.619; 7.219, 222, 245, 258; 8.267, 268, 272, 331; 11.485, 527, 545, 565, 572; 16.107; 17.128, 132; 18.193; 23.820).

- 7
S. Butler (trans.), *The Iliad of Homer, rendered into English prose for the use of those who cannot read the original* (London: Longmans, Green & Co., 1898), pp. 109, 178, 285.
- 8
P. Connolly, *The Ancient Greece of Odysseus* (Oxford: Oxford University Press, 1998), p. 32.
- 9
R.P. Keep (trans.), *A Homeric Dictionary for Schools and Colleges, based upon the German of Dr. Georg Autenrieth* (revd. edn., New York: Harper and Brothers, 1891), p. 219.
- 10
Lattimore uses the phrase ‘massive in the middle’ but ὀμφαλόεις actually refers to a domed shield boss.
- 11
Teukros’ shield (*Iliad* 15.479) and Laertes’ shield (*Odyssey* 22.122) are both described as being constructed of four layers of hide.
- 12
The Spanish *adarga* was a medium-sized heart-shaped shield made from layered hide. Typically it would be made from three or four layers. The construction of the *ardaga* can give insight into the possible construction of Homer’s shields.
- 13
Agamemnon’s shield is decorated with ten circles (κύκλοι) of bronze. These are probably multiple concentric circular ridges running around the shield. Note the embossed rings on the shield in [Figure 3](#).
- 14
In the *Description of Greece* (5.10.4), Pausanias describes a golden shield in the Temple at Olympia with a relief of Medusa on it.
- 15
It is unclear what is meant by ῥάβδοισι (from ῥάβδος). It could mean ‘rivets’, ‘studs’, or even ‘stitches’. Lattimore uses ‘staples’. The word seems to have been more commonly used to describe a rod or staff.

16

P. Connolly, *Greece and Rome at War* (London: Greenhill, 1998), pp. 53-54.

17

It should be noted that all iconographical evidence can be subject to multiple interpretations. The skill of different artists may vary considerably and one cannot assume that all illustrations are drawn to scale.

18

L.L. Loendorf and S.W. Conner, 'The Pectol shields and the shield-bearing warrior rock art motif', *Journal of California and Great Basin Anthropology* Vol. 15, No. 2 (1993), pp. 216-224.

19

G.P. Hammond and A. Rey (eds.), *Don Juan de Oñate. Colonizer of New Mexico, 1595-1628* (Albuquerque: University of New Mexico Press, 1953), p. 841.

20

F.R. Secoy, *Changing Military Patterns on the Great Plains (17th century through early 19th century)* (Seattle: University of Washington Press, 1953), p. 68.

21

Connolly, *op. cit.* (note 16), p. 131.

22

J.M. Coles, 'European Bronze Age Shields', *Proceedings of the Prehistoric Society* Vol. 28 (1962), pp. 156-190.

23

Many smaller bronze shield facings were considerably heavier, however. The Lough Gur shield, for example, ranges from 0.7mm to 1.3mm and weighs a little under 3kg (6.5lbs). If a smaller circular shield is made using the proposed multi-layered construction, then the thickness of the bronze facing should be in this range, not the suggested 0.3mm.

24

J. Kohlmorgen, *Der mittelalterliche Reiterschild. Historische Entwicklung von 975-1350 und Anelitung zum Bau eines kampftauglichen Schildes* (Wald-Michelbach: Karfunkel

Verlag, 2002), p. 105.

25

Coles, *op. cit.* (note 22).

26

Connolly, *op. cit.* (note 16), pp. 231–233.

27

Connolly, *op. cit.* (note 16), p. 53, with illustrations on pp. 52 and 56.

Appendix 2

1

The term χαλκοχιτώνων ('bronze-clad') is used 31 times: *Iliad* 1.371; 2.47, 163, 187, 437; 3.127, 131, 251; 4.199, 285, 537; 5.180; 6.454; 7.275, 444; 8.71; 10.136, 287, 367; 11.694; 12.352, 354; 13.255, 272; 15.56, 330; 17.414, 485; 18.105; 23.575; 24.225.

2

Bronze-armoured Epeians: *Iliad* 4.537–8, 11.693; bronze-armoured Kretans: 13.255; bronze-armoured Boiotians: 15.330; bronze-armoured Myrmidons: 23.129–30.

3

P. Manti & D. Watkinson, 'From Homer to Hoplite: Scientific Investigations of Greek Copper Alloy Helmets', in S.A. Paipetis (ed.), *Science and Technology in Homeric Epics* (History of Mechanism and Machine Science Series, Vol. 6) (London & New York: Springer Science, 2008), pp. 167–179.

4

References to cutting and stabbing the shoulder: *Iliad* 5.80, 98–9, 188–9, 146–7, 400; 11.420–1; 13.520; 14.450; 15.341–42; 16.289, 323, 343; 17.598–9.

5

R.P. Keep (trans.), *A Homeric Dictionary for Schools and Colleges, based upon the German of Dr. Georg Autenrieth* (revd. edn., New York: Harper and Brothers, 1891), p. 193.

6

Cf. *Iliad* 4.132-3.

7

Injuries to the thigh: *Iliad* 5.305, 660, 694; 11.583, 662, 809, 844; 16.308, 314. Injuries to buttocks: *Iliad* 5.66; 13.651.

8

References to 'well-greaved Achaeans': *Iliad* 1.17; 2.331; 3.86, 156, 304, 343, 370, 377; 4.80, 414; 5.264, 324, 668; 6.529; 7.57, 67, 172, 311, 430; 11.149; 12.141; 13.51, 401; 14.49; 17.370; 18.151; 19.74; 23.272, 658, 721; 24.800.

9

References to *telamon*: *Iliad* 2.388; 5.796, 798; 7.304; 11.38; 12.401; 14.404; 16.803; 17.290; 18.480, 598; 23.825.

10

References to horsehair crests: *Iliad* 3.337; 4.459; 6.469, 494-5; 11.42; 12.339; 13.614; 15.480-1, 536-7; 16.138, 338, 797; 17.295; 19.381; 21.205.

11

The neck was a common target area, presumably because it was poorly armoured. References to attacks to the neck: *Iliad* 7.262; 13.339; 14.465; 15.451; 16.332, 339; 20.455, 482.

12

It is possible that Achilles punched his spear straight through the bronze helmet and into the ear.

Appendix 3

1

J. Aruz (ed.), *The Art of the First Cities: The Third Millenium B.C. from the Mediterranean to the Indus* (New York: Metropolitan Museum of Art, 2003), pp. 157-8.

2

The Kalkriese helm was made of 5 pieces.

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